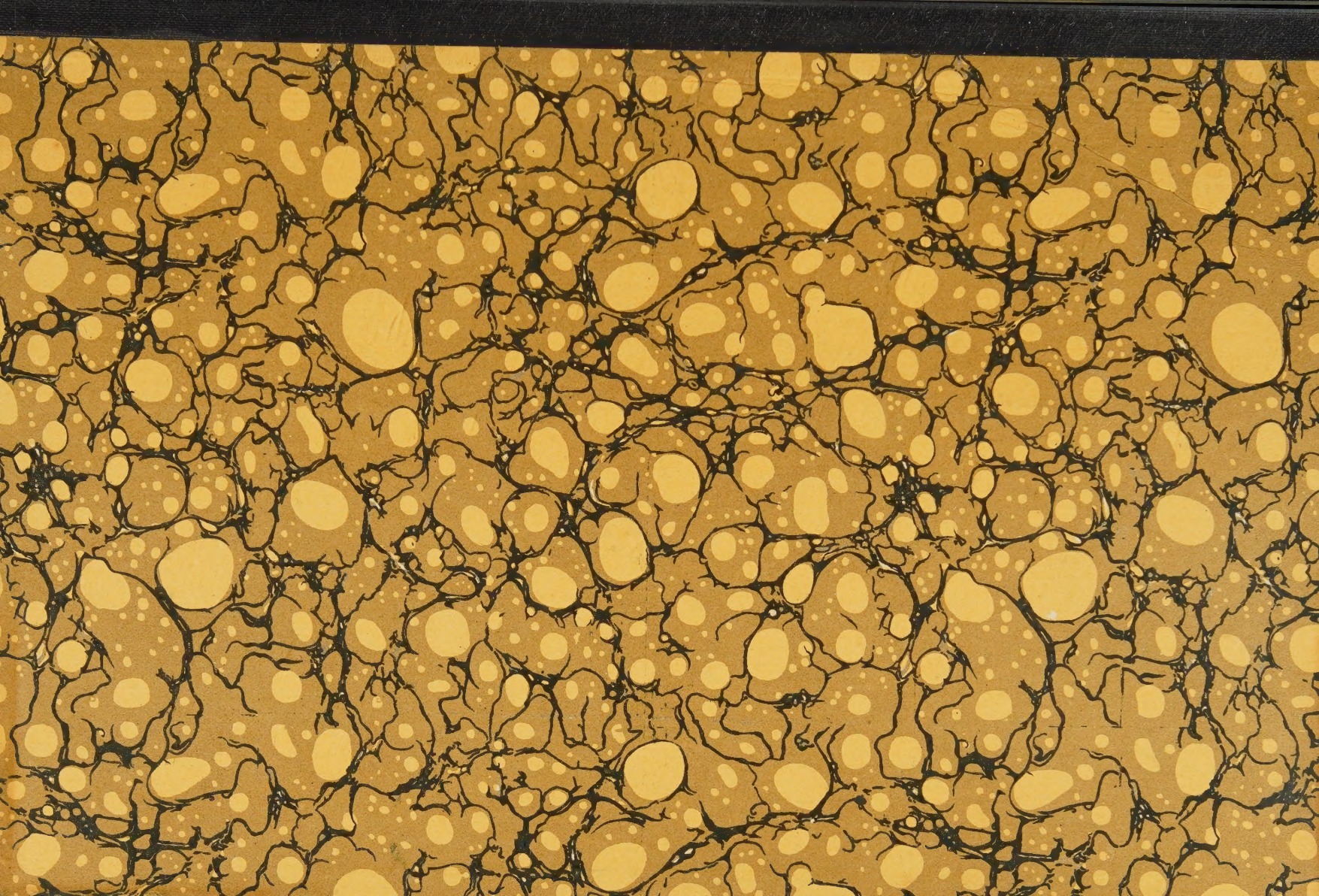

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THE NEW

STUDENT'S REFERENCE WORK

FOR

TEACHERS STUDENTS AND FAMILIES

EDITED BY

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THE STUDENT'S CYCLOPÆDIA
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Sargas'sum, a genus of brown seaweeds whose species are often observed floating in great masses in the large eddies formed by oceanic currents. These regions of comparatively stagnant water covered by sea-weeds are known as Sargasso Seas, the prevailing type being a species of *Sargassum*. See PHÆOPHYCEÆ.

Sar'gent, John Singer, an American painter, was born of American parents in Florence, Italy, in 1856. He was educated in Italy, France and Germany. His early art-training was under Carolus Duran by whom he was chosen to assist in the execution of important government commissions wherein he mastered the secrets of French technique. His chief works are in portrait and genre; among the former *Carolus Duran*, *Joseph Jefferson*, *William M. Chase*, *Homer St. Gaudens*, *President Roosevelt;* among the latter, *Fishing for Oysters at Cancale* and *Neapolitan Children Bathing*. His most ambitious and original works are the decorations in the Boston Library which include the famous *Frieze of the Prophets*. His portraits reflect clearly even the subtilest traits of individuality. His manner is French, and his treatment superior. His *Dogma of the Redemption*, a portion of the wall-painting in the Boston Library, is deeply devotional and one of the finest Christian paintings of the period. It is divided into an upper and lower panel, which seem to represent Heaven and Earth; in the upper are the three persons of the Trinity enthroned, redeeming the world; in the lower are angels bearing the reeds, nails, the spear and crown of thorns.

Sar'gon. See ASSYRIA.

Sarma'tians, a race who spoke the same language as the Scythians. They were nomads, wild and savage in looks, good horsemen and bowmen, and dressed in leather armor. Their young women went into battle on horseback, a custom which may have caused the Greek stories about the Amazons. They were made of several tribes that roamed the wide plains from the Vistula and the Danube to the Volga and the Caucasus. In the second half of the 4th century B. C. they conquered the Scythians (*q. v.*). Their empire lasted till the 4th century A. D., when it was overthrown by the Goths.

Sar'nia, Can., stands where St. Clair River issues from Lake Huron. The submarine tunnel connecting the railway systems of Ontario with those of Michigan is here. Steamers leave Sarnia twice a week for Duluth. There is ferry-communication with Port Huron (Michigan). The oil-refineries, salt-works and lumber are extensive industries.

Sar'saparil'la is the dried root of the smilax, a native plant of Central America. It is a twining shrub, which grows only where water is plenty. The brownish root is many feet long and about as thick as a goose-quill. A liquid extract is used as a flavoring and a medicine.

Sar'to, Andrea del, a painter of Florence, where he was born in 1487 or 1486. His family name was Vannucchi, but he was nicknamed Del Sarto — the tailor's son — from his father's business. He painted two series of frescos in Florence, the best of the first series being *Nativity of the Virgin* and *Journey of the Three Kings*. He spent a year in Paris at the invitation of Francis I, and was very popular among the French. The most celebrated of his single pictures are the *Last Supper*, the *Madonna with the Harpies* and *Fathers of the Church Disputing*. Del Sarto was a rapid worker, and excelled in accurate drawing. Michael Angelo rated him highly. He died at Florence in 1531. See Crowe and Cavalcaselle's *Painting in Italy*.

Saskatche'wan, a province of the Dominion of Canada lying west of Manitoba and having Alberta on the west, Mackenzie on the north and the United States on the south. It has an area of 251,000 square miles. The province is a vast plain, containing 159,038,720 acres, and the greater portion of its southern two thirds is situated in the great wheat-growing belt. The portion adjoining or lying near to Manitoba possesses much of the characteristics of that province as to soil, topography, climate, rainfall and, consequently, productive adaptabilities. The soil is a friable loam, easily worked and producing excellent crops of wheat, coarse grains and vegetables. The winter climate answers all requirements, both as to degree of cold and as to sufficiency of snowfall, for the production of the No. 1, hard wheat for which Western Canada is now noted. The valleys along Saskatchewan, Qu'Appelle, Assiniboine and Souris Rivers, Pipestone, Long and other creeks, are specially adapted for mixed farming, and the open prairie beyond affords large areas for grazing or grain-growing The region is well-served by the Canadian Pacific Railway. Southwestern Saskatchewan is entered at McLean station, and its first considerable town is Regina, the capital of the province. The land here is a rich, fertile loam, as well to the south as to the north. Several new and important towns have sprung into existence along the "Soo" line, as Halbrite, Weyburn, Yellow Grass, Estevan, Milestone and Rouleau. The cultivation of flax is carried on to a considerable extent. Wheat-raising, however, is the important industry of this district, and the yields are highly satisfactory to the producer. Between Regina and Moose Jaw there is splendid land, and mostly occupied by prosperous farmers. The central portion of the province is almost centrally divided by the main Saskatchewan River, which is altogether within the district, and by its principal branch, the North Saskatchewan — most of the navigable length of which lies within its boundaries. It includes, in the south, a

small proportion of the great plains, and in its general superficial features may be described as a mixed prairie and wooded region, abounding in water and natural hay and well-suited by climate and soil for the raising of wheat, cattle and sheep. As a general thing, the surface is gently undulating prairie. Northern Saskatchewan consists of the eastern half of the late Territory of Athabasca and embraces an area of about 70,000,000 acres, enough for a fine-sized province in itself. As yet it is not opened for settlement because of its inaccessibility and distance from railway systems, the nearest railway station being Prince Albert. The province had a yield of wheat of 30,000,000 bushels in 1906 and of oats 23,000,000 bushels. The mean summer temperature at Regina is 62.7° and in winter 6.9°. The population is 250,000. Its capital city, Regina, has a population of 7,000, Moose Jaw has 6,500 and Prince Albert 4,000.

Saskatchewan (*săs-kăch'ĕ-wŏn*), a large river of Canada, draws its waters from the Rocky Mountains, and is formed by two head-waters called the south and the north branch. The northern branch rises among the glaciers near Mt. Hooker, the southern branch from a group of springs near the same locality but a short distance to the south. The former has a course of 770, the latter of 810, miles before they meet. The river then flows east 282 miles to Lake Winnipeg, from which its waters are carried to Hudson Bay by Nelson River. Including the Nelson, its whole length is 1,514 miles. Steamers run from Lake Winnipeg to Edmonton (700 miles); the Nelson is spoiled for navigation by rapids.

Sas'safras, the popular and the technical name of a genus which contains but a single species, native to eastern North America. The trees usually are small, but occasionally become 125 feet in height. The root is largely used for the aromatic oil.

Satellite (*săt'ĕl-līt*), a small planet or moon. The term is generally employed in astronomy to denote one planet revolving about another; and hence satellites are sometimes called *secondary* planets, to distinguish them from the *primary* or larger planets. One of the chief points of interest in connection with satellites is that a satellite enables one to determine the mass of the primary as soon as the radius of its orbit, r, and its period, T, are known. For then, if we denote the mass of the primary by M and the mass of the secondary by m, we have

$$M+m=\left(\frac{2\pi}{T}\right)^2 r^3$$

and, since m is practically always negligible in comparison with M, we have

$$M=\left(\frac{2\pi}{T}\right)^2 r^3$$

For a list of the known satellites see *Webster's Unabridged Dictionary*, article *Solar System*. On the evolution of satellites see *Time and Tide* by Sir Robert Ball in the Romance of Science Series.

Sat'inwood, the wood of *Chloroxylon Swietenia* from India. The wood is deep yellow and remarkably close-grained, heavy and durable.

Satolli (*să-tōl'lē*), Cardinal **Francesco,** a Roman Catholic prelate and diplomat of the papal see, was born at Perugia, Italy, July 21, 1831. In 1888 he was created archbishop of Lepanto, and in the following year represented the pope at Baltimore, Md., on the centenary of the Roman Catholic hierarchy and on the inauguration of the Roman Catholic university at Washington, D. C. In 1893 he came again to America as apostolic delegate with plenary powers, and in 1896 received the cardinal's hat. Cardinal Satolli is the author of a *Course of Philosophy* on the *Summa* of St. Thomas and of essays on various philosophical themes. In 1892 his action in regard to church controversies aroused opposition, but was sustained.

Sat'suma Ware, named from the province of Satsuma in Kiushu, is a fine pottery, almost like porcelain, which in its older examples is much sought. The ware has a yellowish glaze, and is ornamented in red, gold, green and silver. The Japanese excel in this hard pottery, although the Chinese are their superiors in the manufacture of porcelain proper. The Japanese employ glazing alloys of a kind unfamiliar in Europe, based generally on copper.

Sat'urn, an early Italian god who presided over farming, his name coming from the word meaning to sow. He most resembles Demeter of the Greek deities, but was later identified or confounded with the Greek Kronos. According to the Greek myth, Kronos the son of Uranos (heaven) and Gæa (earth) is the youngest of the Titans. He married Rhea, by whom he had several children, all of whom he devoured at their birth except the last, Zeus (Jupiter), whom his mother saved by a stratagem. The motive of Kronos was his hope of bringing to naught a prophecy which declared that his children would one day deprive him of his sovereignty, as he himself had done in the case of his father Uranos; but fate is stronger even than the gods, and when Zeus had grown up he began a ten years' war against Kronos and the Titans, ending in their being hurled down to Tartarus and there imprisoned. Other myths added that after his banishment from heaven Kronos went to Italy, where Janus gave him a share in his sovereignty. In this way Zeus' conquest of Kronos, a Greek myth, became the Roman myth of Jupiter's conquest of Saturn. Saturn thus became a divine king, who with fatherly mildness ruled the Italian natives and taught agriculture. Hence the whole

land received the name of Saturnia or Land of Plenty, and his reign was that golden age of which later poets sang. Saturn's temple in Rome stood at the foot of the Capitoline hill.

Saturn. See PLAN'ETS.

Saturnalia (*săt'ŭr-nā'lĭ-ȧ*), **The,** most probably were an old Italian harvest-festival. During the festival slaves sat down to banquets in their master's clothes, while he waited on them at table. Crowds filled the streets, and roamed the city in a peculiar dress; friends sent presents to each other; all business stopped; the courts closed; schoolboys got a holiday; and no war could be begun. The length of the Saturnalia varied at different times in Roman history, but they were usually held on Dec. 17, 18 and 19. The modern Italian carnival seems to be founded on the old pagan Saturnalia.

Satyrs (*sā'tẽrs*), in Greek myth, were a race of woodland deities, half human, half animal. They are generally described as roaming the hills in the train of Dionysus (Bacchus). They looked grotesque and repulsive. They were of robust build, with broad, snub noses, large, pointed ears, bristly and shaggy hair, rough skin, little horny knobs on their foreheads and small tails. They were fond of the woodland nymphs, of music, dancing, wine and sleep. They usually were hostile to man. The Roman poets regarded them as the fauns of their own myths, and gave them larger horns and goats' feet. Satyrs were often sculptured; for example, Praxiteles' famous *Satyr* at Athens.

Saul, the first king of Israel, was the son of Kish, a wealthy chief of the tribe of Benjamin. Gigantic in frame, noble in mien and commanding in character, he was well-fitted to unite the tribes. His deliverance of Jabesh Gilead and his victories over the Philistines, Ammonites and Amalekites gave unmistakable proof of ability as a soldier. But soon he became possessed of a wild madness which found vent in an insane jealousy of David, his son-in-law and the chief of his bodyguard, and in a fit of rage attempted David's life with his own hand. Saul fell in a disastrous and bloody battle with the Philistines on Mt. Gilboa about B. C. 1020.

Sault (*sōō*) **Ste. Marie, Mich.,** a port on St. Mary River (*q. v.*), near the outlet of Lake Superior, 290 miles northwest of Detroit. A canal around the rapids or *sault* yearly passes nearly three times as many boats as Suez Canal. An immense iron-bridge connects the railroads from St. Paul and Duluth with those of Ontario. Population 11,445.

Sault Ste. Marie, Can., the most important center in the District of Algoma, opposite the American city of the same name, is an important manufacturing place, as well as famous for two immense canal-locks, one built by the Canadian government, the other by the American government, between Lakes Superior and Huron. A larger tonnage passes through the canals at Sault Ste. Marie per year than through any other canal-system in the world. Large pulp and paper-mills, iron-smelters, steel-rail mills and other important industries make up a large industrial population at this point. The canal was built to overcome the rapids on St. Mary River. The Algoma Central, running north from Sault Ste. Marie, has been a great aid in the development of the district. A rich mining district is tributary to it. The length of the canal between the extreme ends of the entrance-piers is 5,967 feet. One lock is 900 feet by 60 feet. The depth of water on the sills (at lowest water-level) is 20 feet 3 inches. The total rise or lockage is 18 feet. Breadth at bottom is 141 feet 8 inches; at the surface of the water 150 feet. This canal has been constructed through St. Mary's Island on the northern side of the rapids of the river and with that gives communication on Canadian territory between Lakes Huron and Superior.

Savan'nah, Ga., a city and port on Savannah River, 18 miles from its mouth. It is situated upon a level, sandy bluff 46 feet above the river. Its streets are broad and shaded by beautiful trees, and its parks or squares at every other intersection of its streets invest it with unique beauty. Forsyth Park (33 acres) is one of the most attractive places in the south. Bull Street, the principal avenue, contains monuments to Nathanael Greene, W. W. Gordon, Lafayette McLaws, Francis S. Bartow, Sergeant Jasper, Count Pulaski and the Confederate dead. Telfair Academy of Arts and Sciences contains the finest collection of art south of Washington. A new city-hall costing $300,000, a new post-office building of Georgia marble, a custom-house, five hospitals, orphan-asylums, and a new high-school are among its public buildings. The Roman Catholic cathedral of the state is here, and also Christ's Church where John Wesley, the founder of Methodism, first preached in America. The school buildings are among the best in the country, and $165,000 are spent annually to maintain its excellent system of schools, which have 10,000 pupils and 210 teachers. Savannah is the leading naval-stores port in the world and the third in cotton. Its commerce is the largest of any south-Atlantic port, and it is rapidly growing. The city is noted for its beautiful streets, buildings extensive commerce, artesian water-supply and its attractive suburban resorts. Savannah was founded by Oglethorpe in 1733. taken by the English in 1778, and by Sherman in December of 1864. Its population in 1900 was 54,244, and now is about 70,000.

Savannah River, which with its right branch forms the boundary between Georgia and South Carolina, rises near the southern border of North Carolina and flows southeast to the Atlantic. It is 450 miles long, and is navigable from November to June for large vessels to Savannah and for steamboats to Augusta.

Save (*säv*), a river in southern Austria, an important branch of the Danube, rises in Carniola, crosses Croatia, separates Bosnia and Servia on the south from Slavonia on the north, and falls into the Danube at Belgrade. It is 556 miles long and is navigable for 336 miles to Sissek in Croatia.

Savonarola (*sä'vō-nä-rō'lä*), **Girolamo,** an Italian reformer, was born at Ferrara, Sept. 21, 1452. He was taught at home, and in 1474 entered the Dominican order at Bologna. He first preached at the Dominican convent of San Marco in Florence in 1482, where his harsh voice and lack of the graces of a speaker caused his lectures to be deserted. After seven years' absence in another convent he appeared again before the Florentines, and this time his sterling genius and enthusiasm gained complete success, as he preached against the sins and luxuries of Florence, then at the height of its wealth and brilliancy, under Lorenzo the Magnificent. At this time he stood well with the government, and the church, the pope appointing him vicar-general to carry out a reform that Savonarola had proposed in the Dominican order in Tuscany. But about 1493 he began to preach plainly at the government, and in one of his sermons he referred to the coming of the French under Charles VIII; when what he had foretold happened, Savonarola was one of the committee sent to welcome the French king as the savior of Italy. When the French were forced to leave Florence, a republic was established, of which Savonarola, without holding any office, became the guiding spirit, his party, who were called *Piagnoni* or Weepers from the character of penitence which they professed, being in power. Savonarola aimed at making Florence a model of a Christian commonwealth. Gambling and other vices were sternly punished; vanities of dress were ruled by law; and under the enthusiasm which this prophet stirred among the people women flocked in troops to the public square to fling down their costliest jewelry, and his followers made a "bonfire of vanities" including cards, dice and carnival costumes. Meanwhile his denunciations which did not spare even the pope himself — Alexander VI — and his followers' claim that he was a heaven-sent prophet arrayed the church against him. He refused to go to Rome to answer a charge of heresy, and refused the offer of a cardinal's hat if he would change his style of preaching, and kept on preaching when forbidden by the pope. He was then excommunicated; the elections at Florence were carried by the party called the *Arrabbiati* or the Enraged against Savonarola's upright but vigorous government; and lastly, a Franciscan preacher having denounced him, an appeal was made to the ordeal of fire, a Franciscan and a Dominican monk agreeing to make a trial of this dread ordeal to prove which side in this quarrel was favored by Providence. The trial was not made, owing to difficulties and disputes, the failure destroying Savonarola's prestige among the people. No longer having the support of Florence, he was tried by a church council, tortured, and condemned as a heretic and an enemy of the state. So, on May 23, 1498, this extraordinary man and two other Dominicans were strangled and their bodies burned by the executioner. See his *Life* by Villari (English translation); Mrs. Oliphant's *Makers of Florence;* and George Eliot's *Romola.*

Saw'fish, a cartilaginous fish related to sharks and rays, with the snout prolonged into a bony blade and sharp teeth along each edge. The body is shaped like that of a shark, and the saw sometimes reaches a length of six feet. There are 16 to 20 pairs of teeth in different species. These fish normally are inhabitants of warm seas. They abound in the Mediterranean, and are found about the West Indies and off the southern coast of North America. They attack whales and large fish. With the saw they rasp off flesh which is eaten, and sometimes they rip open their prey. Their nostrils and mouth with small teeth are on the under surface of the head near the base of the saw.

Saxe-Coburg-Gotha (*kō'bûrg-gō'tä*), a duchy in Thuringia, one of the German states, area 764 square miles, with a population of 242,432. The principality consists chiefly of two detached portions, the duchy of Gotha in the north and the duchy of Coburg in the south, the chief towns of which are Gotha (population 36,947), and Coburg (population 22,488). The reigning family, until 1893, was represented by Duke Ernest II, who was succeeded by his nephew Prince Alfred of England, Duke of Edinburgh, who died in 1900. A son of the latter, heir presumptive, having died in 1899, the duke of Connaught became heir to the ducal throne; but, as he with his son renounced all claim to the succession, the throne fell to the present incumbent, Charles Edward, son of Prince Leopold (Duke of Albany). The latter succeeded on July 30, 1900. There are 173 miles of railway, the chief products being agricultural and the crop consisting largely of rye, wheat and barley.

Saxe (*säks*), **John Godfrey,** was born at Highgate, Vt., June 2, 1816. He graduated at Middlebury College, Vermont, in 1839,

became a lawyer and for seven years practiced in his native county. For six years he owned and edited a newspaper at Burlington. He also served a year as state's attorney and ran for governor on the Democratic ticket in 1859 and 1860. Saxe's poetry was mostly satirical and soon gained great popularity, his first volume going through over 40 editions. Among his verses are *The Proud Miss McBride*, *The Money King* and *The New Rape of the Lock*. Saxe died at Albany, N. Y., March 31, 1887.

Saxe, Maurice, Marshal, a celebrated soldier of the 18th century, was the natural son of Augustus II, Elector of Saxony, and the countess of Königsmark, and was born at Goslar, Hannover, Oct. 28, 1696. When only 12, he ran away to Flanders, joined the army of Marlborough, and took part in the capture of Lille and the siege of Tournay. With a boyish love of change he joined the Russo-Polish army in 1711 and distinguished himself under his father's own eyes. After fighting against the Turks in Hungary, he in 1726 was chosen Duke of Courland, and for three years stubbornly defended the duchy against both Russians and Poles. At length, forced to give it up, he fought under the Duke of Berwick, and decided the battle of Ettlingen by a desperate charge. On the breaking out of the Austrian War of Succession he was given command of an army to invade Bohemia, stormed Prague, and captured Egar. In 1744 he was made a marshal of France, put in command of the French army in Flanders, and with masterly genius kept a much larger force of the enemy inactive, at the same time capturing important fortresses. The following year was more glorious still; he defeated the Duke of Cumberland at Fontenoy, thus winning one of the greatest French victories over the English. Next year he won against the allies the brilliant victory of Raucoux, and in 1747 for the third time defeated Cumberland at Laufeldt and forced the allies to agree to the treaty of Aix-la-Chapelle. Saxe died on Nov. 30, 1750. George Sand was Saxe's great-granddaughter. See Carlyle's *Frederick the Great*.

Saxe-Meiningen (*săks-mī'nĭng-en*), a duchy in Thuringia, one of the states of the German empire. The charter of the duchy dates from 1829; its capital is Meiningen (population 15,985). The reigning duke is Georg II, son of Duke Bernhard I, who succeeded on the abdication of Duke Bernhard in 1866. The area of the duchy is 953 square miles, with a population, almost entirely Protestant, of 268,916. Like the duchy of Saxe-Coburg-Gotha, its products are mainly agricultural, the chief crops being rye, oats, wheat, hay and potatoes. It has 150 miles of railways.

Saxe-Weimar (*săks-vī'mär*), a grand-duchy of Thuringia, one of the German states, whose constitution dates from 1816. Its area (1,397 square miles, with a population of 387,316) consists of three detached districts — Weimar, Eisenach and Neustadt. The capital is Weimar (population 31,117), and the reigning grand-duke is Wilhelm Ernst. The government is an hereditary constitutional monarchy. The chief industry is agriculture, though there are some manufactures, mainly cotton and woolen. Weimar is famous as the home of Goethe, Herder and Schiller, the former long participating in the government. Duke Charles, about 1800, made Weimar the European Athens of his day.

Sax'horn, a series of brass, wind, musical instruments invented by Antoine or Adolphe Sax, who was born at Dinant, Belgium, in 1814, and settled at Paris in 1842. By means of this and another family of instruments called saxophones he has greatly influenced military music throughout the world. The saxhorn is a conical tube opening out to a wide bell, is sounded through a cupped mouthpiece, and is provided with valves or pistons like a cornet. Saxhorns are made in different sizes, the series having a very wide compass. Their number and variety supply all the different parts required by a brass band, and in many places good bands are wholly made up of them. From the fact that their fingering is all alike a performer having mastered one can by a little practice play as well on any of the others. Their compass, richness and flexibility of tone render them especially fit for military music, and their form makes them easy to play either on the march or on horseback.

Sax'ifrage. A genus of plants found in the north temperate and Arctic regions. It includes about 160 species, mostly perennial herbs, natives chiefly of mountainous tracts. Cultivated varieties are grown on rockeries. Some are densely tufted, moss-like plants, which form a flowery turf. The most common varieties in the United States are the early saxifrage found in Virginia, the swamp saxifrage in swamp-lands of Pennsylvania and the Chinese saxifrage, a hanging-basket plant Cultivated varieties grow well in good soil. The seed should be sown as soon as ripe in a cold-frame; or saxifrages may be propagated by division in the spring.

Sax'ons, a Germanic people, whose name is thought to come from an old word meaning knife. A Saxon league was formed in the 3d century of tribes living along the Elbe inlet and on the neighboring islands. The Saxons invaded Roman territory in the reigns of Julian and Valentinian, and about 450 they, with the Angles, established permanent settlements in England (*q. v.*) and founded the Anglo-Saxon kingdoms. Before the 5th century they had settled along the French sea-coast from the Elbe to the

Loire, but these settlements soon became a part of the kingdom of the Franks. At home the Old-Saxons widened their country till it embraced all between the Rhine and Elbe, the North Sea and the Harz Mountains. Saxons and Franks together destroyed the Thuringian kingdom in 531. The Frankish war of conquest was waged against the Saxons from 719 to 804, the Franks at last conquering under Charlemagne, in spite of the stubborn defense of the Saxons under their leader Wittekind. The Saxons gave up their pagan worship with their freedom, and accepted Christianity.

Sax'ony, a German kingdom, in area the fifth and in population the third state of the empire; it covers 5,787 square miles, and has a population of 4,500,601.. For the present state of Saxony see GERMAN EMPIRE.

After the division of the territories ruled over by Charlemagne, the Frankish conqueror of the Saxons, that nation became a part of Austrasia. Its first duke was Otto (880–912). His son Henry made himself master of all the territories included in the present kingdom of Saxony, the Prussian province of Saxony, the smaller Saxon duchies and more besides. The German emperors after 1024 were Franconians and their greatest enemies were the Saxon dukes, especially Henry the Proud of Bavaria and Henry the Lion. Rudolph II (1356–70) first took the title of Elector of Saxony. During the Thirty Years' War Elector John George I (1611–56) sided with the Protestants, but in 1635 made his peace with the emperor, on which account his lands were ravaged by the Swedes for ten years. Frederick Augustus I (1694–1733) became a Roman Catholic and was chosen king of Poland. After that the headship of the Protestant states of Germany passed to the Elector of Brandenburg, and to this day the court of Saxony is Roman Catholic. Saxony warred against Charles XII of Sweden and suffered greatly at his hands; was defeated by Prussia in the second Silesian War; and was conquered by Frederick the Great in the Seven Years' War. Frederick Augustus III (1763–1827) proclaimed himself king of Saxony, and sent his army to support Napoleon. For this the Congress of Vienna took over half his territory to form the new province of Prussian Saxony. In the Austro-Prussian war of 1866 Saxony sided with Austria, was defeated, and joined the North German Confederation. In the Franco-Prussian War the Saxon army fought on the side of Prussia, and since 1871 Saxony has been a part of the German empire.

Saxophone (*săks'ō-fōn*), the name of a group of musical instruments invented by Adolphe Sax. (See SAXHORN.) The saxophone is a conical, brass tube, sounded by a mouthpiece furnished with a single reed like that of a clarinet, and is made in as many different keys as the saxhorn. It has 20 holes, covered by keys and studs, for the first three fingers of each hand. All saxophones are fingered alike. They are greatly valued in military music, but are not much used in orchestras.

Sax'ton, Joseph, American inventor, was born at Huntingdon, Pa., March 22, 1799, and died at Washington, D. C., Oct 26, 1873. At an early age he showed much mechanical ingenuity, which manifested itself later in inventions and improvements in connection with the mechanism of clocks; he constructed the clock for the tower of Independence Hall, Philadelphia, and superintended the construction of the machinery and delicate weighing-balances for the Philadelphia mint. He spent some years, early in the thirties, in England, and while there constructed a magneto-electrical machine, by which the first magnetic spark was obtained; he made much of the apparatus used by Wheatstone, the physicist and inventor; and devised a locomotive differential pulley. Among his other inventions were a deep-sea thermometer, an immersed hydrometer and a self-registering tide-gauge. He was one of the founders of the American Academy of Sciences.

Sayce (*sās*), **Archibald Henry,** one of the greatest of living philologists and archæologists, was born at Shirehampton, England, Sept. 25, 1846. After attending Grosvenor College at Bath, he entered Queen's College, Oxford, in 1865, and became a fellow and tutor of his college. In 1876 he was appointed assistant to Max. Müller in the chair of comparative philology at Oxford, which he resigned in 1890. Professor Sayce was a member of the Old Testament revision-committee in 1874. The most important among his many books, which rank among the first in scholarship and value, are *Ancient Empires of the East, Fresh Light from the Monuments, The Hittites* and *Races of the Old Testament.*

Scale (in plants). The word has two applications. Epidermal outgrowths, which technically are hairs, sometimes assume the form of scales which more or less overlap one another. The more general application of the term, however, is in connection with the protecting leaves of scaly buds or the reduced leaves of underground stems. Such leaves are not green, are not much developed, and often are firmer than ordinary leaf-tissue. The scales of underground stems probably are merely reduced leaves, with no function; the scales of aërial buds, however, are distinctly protective organs, and not only are firm and resistant, but are frequently covered with hairs or gummy products.

Scale-In'sects, the name of a large number of flat insects, with scale-like bodies, of

the family *Coccidæ*, also called scale-bug or bark-louse. They live on the sap of plants. Almost all are looked upon as pests, doing much damage to fruit-trees, shade-trees and smaller plants. Among the more important are the cottony cushion or fluted scale; long-spined mealy bug; destructive mealy bug; cottony maple scale; barnacle; Florida wax; soft; terrapin; hemispherical; black; orange chionaspis; scurfy bark-louse; West Indian peach scale; horse-chestnut; Putnam or cranberry; linden; European fruit; cherry or Forbes; grape; walnut; palm, San José; greedy; oleander; circular; California red; Glover's or long; oyster-shell bark-louse; purple scale; white fluted or mealy wing. The cottony-cushion scale did a great amount of injury to trees in California, and was combated by introducing a lady-bird which preyed upon it A scale-insect which forms a large cottony egg-case, making it a conspicuous object on the trees, has done much injury to maple-trees in various parts of the United States. The scale-insects infesting orange and lemon trees have done very great damage; including the long, purple, Florida red and chaff scales, the orange chionaspis, California red, the white or fluted and the black. The San José scale has worked wide-spread damage in the country; the pest has spread from California to every state in the Union. It does not attack the citrus-fruits; but other orchards suffer greatly from it young peach-trees markedly so, and shade and ornamental trees are greatly injured thereby. It is spread by nursery-stock and by fruit. When the pest is present, twigs are marked by a gray, scaly substance. Consult *Bulletin 88*, Mass. Agricultural College; Marlatt: *Farmers' Bulletin 172*, U. S. Department of Agriculture, 1903; and Comstock: *Manual for Study of Insects*. For remedies see SPRAYING-MIXTURES.

Scal'lop (*skŏl'lŭp*), numerous widely distributed and well-known mollusks inhabiting salt water. Their shells are marked with radially arranged ridges and are often bright-colored. The animal living within is somewhat like a clam, with a slender foot, orange or reddish in color. The mantle, which covers the animal and secretes the shell, is provided with many, small, sparkling eyes arranged around the margin. Those show when the shell is open. When young, scallops swim by opening and shutting the valves of their shells; but, as they grow older, they become sedentary. The larger scallop-shells are often used for baking and serving shredded fish and oysters in cracker-crumbs.

Scalp, the outer covering of the skull. Its skin does not differ from that of the rest of the body, except that hair grows on it more abundantly. Besides the skin, the scalp is formed of an expanded muscle or tendon and cellular tissue and blood-vessels. Scalping was a favorite practice of the American Indians in war, in which the scalp with the hair attached was partly cut and partly torn away, the victim being either alive or dead. The scalps were worn as trophies by the warriors.

Scan'derbeg. (Iskander Beg or Bey), an Albanian chieftain, was born in Albania, about 1403, of Servian parents. He was called George Castriota by the Christians. He was carried away by the Turks when seven, and brought up a Mohammedan. His bravery and skill made him a favorite with the sultan, who put him in command of a division of his army. In 1443 he deserted the Turkish army with 300 Albanians, and renounced Mohammedanism. In less than a month the whole of Albania was in arms, Scanderbeg was chosen chief, and the Turkish garrisons driven out of the country He was defeated by the Turks but once in all the struggles that followed, destroying 40,000 Turks, with 15,000 Albanians, and defying the Sultan himself with his army of 150,000, until he retired disgusted from the conflict. Pope Pius II tried in vain to league the Christian princes together to help Scanderbeg in his conflicts with the Turks, but succeeded in inducing him to break a truce of peace, made in 1461, and renew the war alone. He again defeated every force that attacked him, even driving back Mohammed II, the conqueror of Constantinople, who conducted two campaigns against him in person. Scanderbeg died at Alessio, of malarial fever, Jan. 17 1468. Consult Ludlow's *Captain of the Janizaries*.

Scan'dina'via, a long península in the north of Europe, lying on the Arctic Ocean, the Norwegian Sea, the Baltic Sea and the Gulf of Bothnia. Geographically it includes Norway and Sweden, historically Denmark and Iceland, while its literature includes the literary work of the Swedish race in Finland even. See DENMARK, LITERATURE, NORWAY and SWEDEN.

Scarabæus (*skăr'ă-bē'ŭs*), a name commonly restricted to the tumble-bugs or dung-beetles, but properly including other members of the large family *Scarabæidæ*. The tumble-bugs form round balls of dung and roll them considerable distances, and finally bury them in the ground. The female lays an egg in this mass, which serves as food for the larva after the egg hatches. The most famous scarab is the sacred beetle of the ancient Egyptians. These were highly venerated and placed in tombs with their dead, where four different species have been preserved. A strange symbolism grew up in reference to these insects. The ball they rolled was taken to represent the earth, the rayed head of the insect the sun, the 30 joints in their six tarsi the days of the month. They became accepted as

emblems of power and resurrection. They are found sculptured on monuments and tombs. Gems were also cut in the form of the scarab and worn in rings and amulets. The Greeks and Etruscans borrowed this custom of engraving the scarabæus on gems.

Scar'let Tan'ager. See TANAGER.

Scheffer (*shĕf'fĕr*), **Ary,** a painter, was born at Dordrecht, Holland, Feb. 12, 1795, and studied in Paris. His first pictures were inspired by Goethe's, Byron's and Dante's poems, and included *Margaret at the Well, Faust in His Study, Suliote Women* and the well-known *Dante and Beatrice in Heaven.* After 1835 he turned to religious subjects, painting *Christus Consolator* (Christ the Consoler), *Temptation of Christ, St. Augustine and Monica* and others. His pictures are chiefly remarkable for depth of feeling and refinement of expression. Collectors prize them so highly that in 1870 even a small replica sold for $9,607. Some of his best portraits are those of Lafayette, Madame Guizot, Talleyrand, Liszt and Lamartine. He died at Argenteuil, near Paris, June 5, 1858. See *Memoir* by Mrs. Grote.

Scheldt (*shĕlt*), a river of Europe, rising in France, flowing north through Belgium past Ghent and Antwerp, enters the North Sea at Flushing by two arms, going north and south of two small islands. It is 267 miles long and navigable for 211 miles. The Dutch claimed the navigation of the lower Scheldt in the 17th and 18th centuries and demanded toll of all foreign vessels sailing on it. In 1831 the rights passed to Belgium when it separated from Holland. In 1863 Belgium gave up the claim for $3,750,000 paid by foreign nations.

Schelling (*shĕl'ĭng*), **Friedrich Wilhelm Joseph,** a German philosopher, was born at Württemberg, Jan. 27, 1775. He studied theology and philosophy at Tübingen and science and mathematics at Leipsic. He succeeded Fitchte as teacher of philosophy in the University of Jena in 1798. From 1803 to 1808 he was professor at Wurzburg; until 1820 secretary of the Royal Academy of Arts at Munich; professor at Erlangen until 1827, when he returned to Munich to a position in the new university there; and finally was called to Berlin by King William IV in 1841. He died in Switzerland in 1854. He began as a follower in philosophy of Fitchte and Hegel, with whom he ranks among German philosophers, but later was influenced by Spinoza and Boehme. His many philosophical works include the *Inquiry into the Nature of Human Freedom, The Possibility of Any Form of Philosophy, Philosophy of Nature* and *The World-Soul.* See Morell's *History of Philosophy.*

Schenck (*shĕnk*), **Robert Cumming,** American soldier and diplomat, was born at Franklin, O., Oct. 4, 1809, and died at Washington, D. C., March 23, 1890. He served eight years in Congress (1843-51), when he was appointed minister to Brazil. He was afterwards sent on diplomatic missions to Buenos Aires, Montevideo and Paraguay. In the Civil War he was appointed (May, 1861) brigadier-general of volunteers and took part in the two battles of Bull Run as well as in that at Cross Keys. In September, 1862, he was promoted major-general and given command at Baltimore, which he protected during Lee's invasion of Maryland. From 1863 to 1871 he represented Ohio in Congress on the Republican side, and from 1871 to 1876 was minister to Great Britain. He rendered distinguished service in bringing about Anglo-American arbitration of the *Alabama* claims He subsequently practiced law at Washington, D. C.

Schenectady (*ske nĕk'tà-dĭ*) **N. Y.,** a city, county-seat of Schenectady County, 17 miles northwest of Albany. It is on Mohawk River and Erie Canal and is a manufacturing city. It has the works of the General Electric Company, which employs 15,000 people, and the Westinghouse electric works; besides knitting-mills stove-foundries, locomotive-works and pump, steel springs, wire-railings, wheelbarrow and broom factories. The principal public buildings are the post-office, county court-house, municipal buildings, Van Curler opera-house, state armory, Home of the Friendless, Children's Home, Ellis Hospital and Y. M. C. A. building. It is the seat of Union College, founded in 1795, and with the law and medical schools and Dudley observatory at Albany and the academic and engineering departments in Schenectady, forming Union University Schenectady has 22 churches and excellent parochial and public schools, the public high-school being known as Union Classical Institute. This school owns its library and the city has a beautiful, free, public library. Schenectady was settled by the Dutch in 1661 In 1690 it was burned and the citizens massacred by the French and Indians. Population 77,000.

Schiller (*shĭl'lĕr*), **Johann Christoph Friedrich,** a German poet, was born at Marbach, in Württemberg, Nov. 10, 1759. He studied law and then medicine in the school at Ludwigsburg, established by Duke Carl Eugen of Württemberg, where he received three medals, though he had spent more time in reading and writing poetry than in studying medicine. His first play, *The Robbers,* in 1782, was produced at Mannheim. The people were so eager for it that they filled the theater at noon, five hours before the play began, and it made a tremendous sensation, being full of the revolutionary spirit that preceded the French Revolution. Because Schiller had twice left Stuttgart without the permission of the duke, he was arrested and forbidden to write plays or to leave Württemberg, which led to his flight to Mannheim under

the name of Dr. Ritter. For a time he was dramatist to the theater in Mannheim and published a theatrical journal in which appeared many of his best poems and a part of *Don Carlos*, finished later at Dresden. He kept up his philosophical and historical studies, and in 1788 was given a professorship at Jena and a pension by the duke of Saxe-Weimar which enabled him to marry. His historical works of this period are the *Revolt of the Netherlands* and the *Thirty Years' War*. In 1794 began Schiller's friendship with Goethe, and under the stimulus of his intercourse with him he again began to write poetry, especially his ballads that have made him the people's poet. His drama of *Wallenstein*, written when every hour's writing cost hours of suffering, was finished in 1799. Carlyle calls it "the greatest dramatic work of the 18th century." Settling at Weimar in 1799, to be near Goethe, he wrote *Mary Stuart*, *The Maid of Orleans*, *The Bride of Messina* and *William Tell*, his last finished work. He died, while still young and in his intellectual prime, on May 9, 1805. See *Life* by Carlyle; *Life* by Nevinson in the Great Writers Series; and translations of *Wallenstein's Death* and *Piccolomini* by Coleridge.

Schlegel (*shlā'gel*), **August Wilhelm,** a German critic and poet, was born at Hannover, Sept. 8, 1767. He studied theology at Göttingen, but soon turned to literature, writing poems and other articles for magazines. He was made professor of literature and fine arts at the University of Jena, and lectured at Berlin on the same subjects and at Vienna in 1808. In 1818 he became professor at Bonn. He translated into German verse most of the works of Shakespeare and many of those of Cervantes, Dante, Calderon and Camoens. His translation of Shakespeare, revised by Tieck, is still the classic German version. His critical writings and his lectures were published in three collections. He died at Bonn, May 12, 1845.

Schlegel, Friedrich von, German critic and writer, was born at Hannover, March 10, 1772. He studied at Göttingen and Leipsic, and then began a literary life. He edited with his brother *The Athenæum*, and also, in connection with him, wrote a series of critical essays, which gave an impulse to good work in German literature. His best-known works are *Philosophy of History* and *History of Literature*, two series of lectures delivered at Vienna. His book on *The Language and Wisdom of India* was a pioneer in the study of Sanskrit in Europe. His works are collected in 15 volumes. He died at Dresden, Jan. 11, 1829.

Schleiermacher (*shlī'ĕr-mä'kĕr*), **Friedrich Ernst Daniel,** a great German theologian, was born at Breslau, Prussia, Nov. 21, 1768. He studied at the Moravian schools and afterwards at Halle. While preaching at Berlin, he published the first of the works which made him known to the learned world. In 1804 he became a professor at Halle. After that university was closed in 1806 by Napoleon, he returned to Berlin and was active in founding the University of Berlin, in which he became a professor in 1810. His lectures on philosophy and theology brought crowds of students and his sermons increased his influence. His writings also continued, and besides many theological works, which placed him next to Luther as a theologian, his friends after his death published several volumes from his manuscripts. He died on Feb. 12, 1834. See Lichtenberger's *History of German Theology in the Nineteenth Century* and Schleiermacher's own *Autobiography*.

Schley (*slī*), **Winfield Scott,** rear-admiral in the United States navy, was born near Frederick, Md., Oct. 9, 1839. He graduated from the Naval Academy in 1860, and served during the Civil War. He was in command of the Greely relief expedition which sailed in 1884. As commodore he was placed in command of the flying squadron in the war with Spain, and for conspicuous service in the battle of Santiago (July 3, 1898) he was made rear-admiral. In the autumn of 1901 Admiral Schley figured in a court of inquiry arising out of professional controversies between himself and Admiral Sampson respecting the share of honors each was entitled to in the destruction of the Spanish fleet.

WINFIELD S. SCHLEY

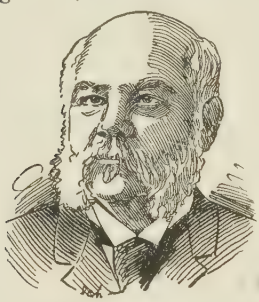
Schliemann (*shlē'män*), **Heinrich,** a German scholar, born at Mecklenburg-Schwerin, Jan. 6, 1822. While in business in St. Petersburg he mastered Greek and the modern languages of Europe. Becoming convinced that the heaps of Hissarlik in Asia Minor covered the site of ancient Troy, when he possessed an independent fortune, he began in 1870 to excavate it at his own cost, carrying on the work for twelve years. He had to pay the Turkish government $10,000 for carrying off all the treasures he unearthed contrary to agreement. His collection is now in the Ethnological Museum at Berlin. In 1876 Schliemann began excavations on the site of the ancient city of Mycenæ in Greece, and the treasures found there are now preserved at Athens. He wrote an account of his work in *Mycenæ and Tiryns*, *Ilios*, *Troja* (Troy) and other volumes. He died at Naples, Dec. 27, 1890, and was buried at Athens.

Schmalkald (*shmäl'kält*), **League of,** an alliance formed at Schmalkalden, a town in Hesse-Nassau, Germany, April 4, 1531, be-

tween nine Protestant princes and eleven imperial cities. Other princes and cities afterward joined the league, until it included nearly all the Protestant states from Denmark to Switzerland. The object of the league was the protection of the Protestants against Charles V and the Roman states. The *Articles of Smalkald*, adopted by the league, were drawn up by Luther at Wittenberg. At the battle of Mühlberg, April 24, 1547, the Protestants, weakened by the withdrawal of Duke Maurice of Saxony, were defeated and the league was broken up.

Schnitz'er, Eduard. See EMIN PASHA.

Scho'field, John McAllister, an American general, was born in New York state in 1831.



GENERAL SCHOFIELD.

A graduate of West Point, he was made a professor there in 1855. When the Civil War broke out, he entered the army as major of the 1st Missouri volunteers, and was on General Lyon's staff when the latter was killed at the battle of Wilson's Creek. He was in command in Missouri until February, 1864, and then of the army of the Ohio. He shared Sherman's southern campaign, and was in most of the battles which ended with the taking of Atlanta, when he returned to Tennessee, defeating Hood at Franklin, and was with General Thomas at the battle of Nashville. Entering North Carolina, he took Wilmington and again joined Sherman, for whom he drew up the supplementary articles of surrender of Johnston's army, which were afterwards approved by the government. In 1868 he became secretary of war and major-general in the regular army. Upon the death of General Sheridan in 1888, he succeeded to the command of the United States army. Previous to his retirement he was, by act of Congress, made lieutenant-general, Feb. 7, 1895. He wrote *Forty-six Years in the Army*. He died on March 4, 1906.

School'craft, Henry Rowe, an American writer, was born in the state of New York, March 28, 1793. After studying at Union College, he visited the mining-region west of the Mississippi and also acted as geologist in an exploring expedition to Lake Superior and the Upper Mississippi under General Cass. In 1822 he was Indian agent for the tribes about the lakes, and in 1823 married the granddaughter of an Ojibway chief who had been educated in Europe. While Indian agent he made treaties that gave the United States 16,000,000 acres. As a member of the legislature of Michigan Territory, 1828–32, he founded its historical society. An expedition which he commanded in 1832 discovered the sources of the Mississippi. After collecting the statistics of the Six Nations, he was employed by Congress in 1847 to gather all the information possible about the Indian tribes, the result being published in five volumes, costing the government $30,000 a volume. He added a sixth volume to the collection in 1857. His works include narratives of his journeys, namely, *Notes on the Iroquois; The Red Race of America; Thirty Years with Indian Tribes* and *The Indian in His Wigwam*. He died at Washington, D. C., on Dec. 10, 1864.

School-Garden, The. Among progressive school-people there is a growing interest in the school-garden. In cities, in normal schools and even in the country, the school-children are set to work cultivating flower and vegetable gardens. The school-garden is an outgrowth of regular school-work; it is one striking phase of the effort to get out of doors, away from books and into contact with the real world. It is a healthy realism putting more vigor and intensity into school-work.

The school-garden has an important relation to several school-studies. First of these is nature-study. There is no better way of bringing children into contact with plant-life than by raising flowers and vegetables in the garden. The boys and girls get out of doors, prepare the soil, plant the seed, watch with great interest the growth of plants, cultivate them through the season, and finally observe the growth and ripening of the fruit. This whole cycle of growth and change is the most fundamental thing in plant-study, and nothing can be more interesting to children than this process when they themselves are concerned in the products of the garden. In the second place the garden has a very important place in the study of geography. In the home-geography in the early grades classes of children are required to visit the gardens and study the processes of cultivation and marketing the products. These are fundamental lessons in geography. In this way gardening leads on to agriculture, scientific farming, fruit-raising and the improvement of country life generally.

There is a strong tendency in all parts of the country to turn the attention of children strongly toward these outdoor studies. The garden naturally suggests farming, the raising of corn and other grains, the feeding of cattle, dairying and butter-making, fruit-culture, as of berries, stone-fruits, apples and pears. Scientific agriculture and fruit-raising are based on principles of careful selection of seed and of wise cultivation, of fertilizing and preserving soils, of grafting, pruning and caring for fruit-trees and of spraying against insect-pests. All these things are vitally interesting to children, and put new meaning into country life.

The school-garden even has an important relation to esthetics. Floriculture, landscape-gardening, tree-planting and fruit-culture appeal to the sense of beauty. The whole yard and garden together need to be planted and laid out on principles of taste and attractiveness.

Perhaps the most important relation of the school-garden is that to the home. Where boys and girls become properly interested in the school-garden, they naturally desire to raise a garden at home in their own back-yard and perhaps flower-beds and trees in the front yard. This answers in many ways to the necessities and comforts of the home. The whole town may take on a new appearance, in its yards and gardens, on account of this interest developed in the school-garden. Beauty and utility are here combined in the best way; the home-table is supplied with vegetables and beautified by the flowers which the children themselves raise.

The educative effect upon the boy or girl of carrying out through the whole season plans for cultivating a garden is one of the best products of good training. The cultivation of plants requires constant attention, forethought, intelligence, self-reliance and a kind of originality; difficulties are to be met and overcome. Insects infest the plants and must be gotten rid of; chickens scratch up and spoil the garden and a fence is needed for protection; a dry spell calls for some plan of watering; weeds quickly take possession of a garden; and the child must be intelligent and thoughtful in meeting such difficulties. This is the best kind of training. To say the least, it is far better than letting the boy run wild on the streets and getting into all sorts of mischief.

Most of our progressive normal schools in all parts of the country are taking up the problem of school-gardens, not for the children simply but for the teachers. Young teachers are set to work to learn the whole problem, so that they may later guide the children in garden work. It is clear that the school-garden is to occupy an important place in the future education of boys and girls.

The value of school-gardens in education has long been recognized in Europe. They were started as early as 1819 in Schleswig-Holstein. In 1869 they were prescribed by law in Austria and Sweden, in Belgium since 1873 and in France since 1880. There are at present about 20,000 schools in Austria having gardens, 45,000 in France, 8,000 in Russia and 2,500 in Sweden. The number in the latter country once was double the present number, but has decreased since the introduction of manual training. School gardening is practically obligatory for the children of the common schools of Belgium, Netherlands, British West Indies and Ceylon. Many German cities teach agriculture by "demonstration" in which the pupils are not allowed any share. Many of the schools of France and Germany have gardens "not with a view to instructing the pupils in agriculture, but for the benefit of the teachers." Many of the foreign governments subsidize the school-gardens, offer prizes, and make training in agriculture obligatory for normal-school graduates.

It may be said in conclusion that school-gardens have an important relation to manual training and to the whole subject of industrial education. It is a phase of manual training to teach children to use the tools and implements of the garden, to prepare the soil and carefully cultivate plants. It is an outdoor physical training combined with intelligent mental effort quite equal in its effects to shop-work and in some ways superior.

Some of the great universities, like Cornell, Illinois, Ohio and Louisiana, have taken up the problem of school agriculture, country life and scientific farming in earnest. Pamphlets are published by experts of agriculture dealing with important phases of school agriculture and school-gardens. Consult Jewell's *Agricultural Education* (Bul. 368, U. S. Bureau of Education).

C. A. McMURRY.

School Or'ganiza'tion and Man'agement, as a somewhat distinct problem calls for elaborate treatment. It embraces the plans of organization, the sources of revenue, the selection of school-sites, the erection of school-buildings, seating, ventilating, lighting and sanitation; the courses of study, choice of textbooks, classification of pupils, preparation and examination of teachers; the general supervision of the school, the authority of the teacher, the management of the classes, rules of conduct, modes of punishment, presentation of motives, relation of teacher and pupils. The student is referred to the following authorities for a general treatment of these problems: *School Economy*, Wickersham; *School Supervision*, Payne; *School Interests and Duties*, King; *School Management*, White; *School Management*, Kellogg; *Theory and Practice of Teaching*, Page; *Systems of Education*, Gill; and *School Hygiene*, Kotelmann (Bergstrom's translation). For detailed treatment of special phases of this broad subject see *Teacher's College Contribution to Education*, Teacher's College, Columbia University.

School San'ita'tion may be defined as the application of knowledge and of the laws of science with a view to the preservation and promotion of the health of those attending school. Formerly the term included little more than the proper heating, lighting and ventilation of school-buildings; but it has been extended to include all factors with which it is practicable for the school to deal, which concern the health of the pupil, as the detection of defects of

sight and hearing, contagious diseases, adenoid growths, causes of malnutrition. In some schools even the teeth of the children are periodically examined by a dentist, who gives free individual advice regarding their care.

As to heating and ventilation, in general that system will be the best which will in the simplest way possible effect an even heat throughout, with sufficient change of air and avoidance of direct draughts upon the pupils. Fire-places are very desirable whenever architectural conditions will permit them. When in use, they insure the best of ventilation and are excellent for furnishing the small amount of heat often required in spring and fall. If a stove is used for heating purposes, it should be surrounded by a zinc jacket extending from the bottom to a distance of several feet above it, to prevent direct radiation. Air is heated at the bottom and rises to the top of the jacket and thus a fair degree of circulation is insured. The chimney should be large and bisected vertically, half being used for the escape of smoke and the other half for the escape of foul air. In large buildings a force-fan is necessary to insure continuous circulation. This can be provided at small cost. Good ventilation demands 2,000 cubic feet of pure air *per* pupil *per* hour. Teachers should assure themselves from time to time as to whether the ventilation system is working, by seeing whether there is sufficient draught up the foul-air flue to draw in a small scrap of paper. For large buildings heating by steam-pipes is preferable to that by hot air, as with hot air it is difficult to have the heat evenly distributed on windy days.

The essential thing in lighting a schoolroom is to secure sufficient light without having it fall directly upon the eyes of the pupils or teacher. For this reason it is best to have all the light come from one side of the room, preferably from the left.

Such good school-desks are now manufactured that there is no excuse for the failure to have pupils hygienically seated at desks adapted to their size.

Teachers should always be on the alert for the detection of any physical defects in their pupils, and these when noticed should be reported at once to the proper persons. Every school should be examined from time to time by a physician with reference to the physical defects of the children.

School-Ships are used to train officers and gunners for the naval service. In the United States seamen-gunners are trained at Newport and gun-captains on training-ships at Port Royal, S. C. The old English battleships *Britannia* and *Hindostan* at Portsmouth, England, are used as school-ships. School-ships are sometimes employed as reformatories, but even in this case they graduate most of their pupils into the navy.

School-Song, The. Since the rote-song in music, like the story in literature, proves to be the "Open! Sesame" of interest to the child, a careful selection of such songs should be made for their initial educational value. The following examples serve to illustrate the uses of song in meeting the problems of music-training for school-grades. The work is divided into three periods: Imitative and Dramatic Period; Investigative Period; and Constructive Period, the different steps showing the development of the subject.

IMITATIVE AND DRAMATIC PERIOD.

In the popular musical pleasantry, *The Chicken*, by Neidlinger the entire spirit of the words is carried over into the music, which naturally represents their meaning in pitch and vocal inflection:

I think when a little chicken drinks
He takes the water in his bill
And then he holds his head way up
So the water can run down hill.

Much to the delight of the little child the water musically "runs down hill" through the descending scale-passage, while the entire song blends speech and song.

The Call of the Crow is a charming bit of musical imaginery by Mrs. Knowlton. To a melodious accompaniment is given the simple call of the crow on two notes for the middle voice, which may be realistically interpreted by the children at first. Later the *caw* suggests a natural vocal lesson, opening and relaxing the throat as adequately as would an Italian exercise. In the two chanting phrases which follow, speech and song are blended:

Over the standing corn
The cheery cry is borne.

Such words as "corn" and "borne" suggest vocal emphasis upon round, open tones. A change of mood is shown at the close in an accompanying note of regret to the words:

How I wish I could go with him,
Where the woods are wild and dim.

The entire song is made on five notes of the scale and, while naturally told, is thoroughly musical and poetic.

The familiar *Mother-Goose* rime set to music by L. Orth:

Blow, wind, blow; go, mill, go,
That the miller may grind his corn;
That the baker may take it
And into rolls make it
And fetch us some hot in the morn.
Blow, wind.

gives contrasting movements, slow and fast; broad, full vowels of the first phase, short, quick vowels and rapid enunciation in the second part. The words and increased *tempo* suggest action, the turning of wheels, grinding, kneading and baking. The whole song is an action story which the children will take pleasure in repre-

senting. The broad vowel and breathing involved in the word "blow" furnish the material for a good m sic-lesson, as does the *tempo*, fast and slow, which can be converted into accented time and divided beat, again to be defined by clapping, tapping or marking on the board. The last part of the song repeats phrases of the first and second part, thus closing in good musical form. In this song we have a capital story in music and words, vowel-coloring, repetition of phrases, rhythm, dramatic representation and musical form, besides the suggestions arising from a well-composed accompaniment.

Stevenson's *Bring the Comb* (Modern Music Series, First Book) pictures a mimic band and soldier drill, presenting the problems of rhythm in a playful way. The soldiers mark time and keep step to the drum-beat of the two strong pulses of the measure. In clapping out the pattern of the fife and rat-a-tat-tat of the snare-drum and, later, with the aid of drums and toy instruments, the children define the melody, learning to contrast the elements of time and tune.

For further illustrations in pitch and time, such songs as *The Chicken* and *Katydid* (Knowlton) will be helpful for pitch-studies in high, low and medium tones of songs. Neidlinger's *Robin* and *Squirrel* give good practice in ascending and descending passages. The rhythmic suggestion in *Snow-Balls* and *Scissors-Grinder* (Knowlton) will be freely acted. Favorite rhymes and *Mother Goose* will serve for initial time-lessons in recognizing groups of twos, threes and fours. Miss Bentley's song-primer, the *Zoo*, *Clock* and others give happy suggestions of scale, pitch, time and rhythm lessons for this first period.

First Step. Through these songs the child is introduced to a concrete, musical experience, which must tend to vitalize all his later study. Here he learns to express himself freely in song, to respond to rhythm and to appreciate harmony. On account of his limited power, he will distribute his interest equally over words, rhythm and melody. The words of the song will be helpful in enlarging his vocabulary, in making associations with color, sound, motion and number. The motor-side of music will strongly appeal, leading out into gesture and dramatic action in rhythms, games and dances. The child also becomes familiar with a variety of musical forms, which prepare him for future analysis and reasoning.

Advanced Step. The ear-training and naming of pitch from songs of the preceding stage are followed by translating from memory into syllables; also by recording them in notation. This will be found a helpful transitional step to the sight-singing of the next grade. Simple tonic phrases from Knowlton's *What Robin Told*, *The Crow*, *The Postman*, *The Soldier*, "Workshop's Primer" (Modern Music Series) have been offered by the children, when asked to sing parts of songs from memory.

Original song-making on the part of the children at this period helps to define the phrase and lead to music-construction. The song-sentence, the couplet and quatrain both in words and music can thus be produced, acquainting children with meter and time groups in a practical way.

Folk-games and dances related to the work of the grade carry on the training in rhythm and unite the musical experiences in a larger dramatic whole. Some of the old guild-dances, *Shoemaker*, *The Wool-Weaving* and *Harvest-Dances* of a more formal kind take the place of the freer dramatic games of the earlier period.

The teaching points to be gained might be stated as follows: To gain the expressive use of song,

1. The character of the song should be dramatic and directly related to the child's interest and to school subjects. The song should be used as a story, told in simple language with melody and rhythm directly representative of the content of the words.

2. The vocal aim at this period is to gain fluency of utterance in word and tone. A close relation between tone and language should be kept by means of a study of imitative sounds and words, as expressed in the songs. The children should learn to recognize and group sounds by their qualities, as round, sharp, bright, rolling or humming, leading to combined vocal and reading phonetics. In this way simple vocal exercises in *oh*, *ah*, *e* and *oo* will be drawn directly from the song, as suggested in the *Blow*, *Wind*. Breath-exercises should be developed in the same way.

3. Pitch will first be discovered as sounds in nature and environment are represented, in such songs as *Call of Crow*, *Katydid* and *Steam-Whistle*. This will first be described as high, low and medium, gradually defining the scale. The sequence of tones, or expressive pitch used in the phrases of the songs, develops melody.

4. Rhythm will first be defined by the motions and movements of the body, power to walk, run, skip and march; in the imitations of nature and movements of things these will be further defined by clapping, marching, skipping and acting the various songs as above shown. Thus the pulse or beat becomes recognized by the child through his own self-activity.

5. Corrective work. At this period the monotones can be treated in a special group, ear-training and individual help being given to those deficient in music.

Books of reference: Elliott's *Mother Goose;* L. and J. Orth's *Mother Goose;* Reinecke's *Children's Songs;* E. Smith's

Kindergarten Songs (Vols. I. and II); Neidlinger's *Small Songs for Small Singers* (in *Earth, Air and Sky* Series); Knowlton's *Nature Songs;* Hill's *Songs for Children*, Bentley's *Song Primer;* Hofer's *Singing Games* and *Popular Folk Games and Dances, Modern Music Series;* Primer, First and Second Book, Ed. Music Course, Ginn and Co. See *Teacher's College Record*, January, 1904: *The Teaching of Elementary Music* for fuller discussion of this subject.

INVESTIGATIVE PERIOD

First Step. Proceeding into the second period, songs become more and more the material for theoretical investigation on the part of the pupil. In this distinct stepping over, the esthetic element of song is pushed somewhat into the background. To avoid the dullness which usually creeps into singing at this point, the situation should be strongly reinforced with interesting, descriptive songs, which still retain their vital qualities.

Illustrations: *Patriotic Song*, Knowlton, a vowel study in *e* and in broad phrasing. Translate into pitch names. *The Woodpecker*, sustained singing and rapid enunciation — writing of phrases. *The Fireman*, vocal imitation of bell and whistle — study in pitch. *Wind-Song*, clear, ringing tone — illustrates use of chromatics, sharps and flats. *Squirrel's Thanksgiving*, rapid passages in crescendo and diminuendo—study in time and divided beat. *The Mill*, soft, vibratory singing — study in monotone and climax. *Primer* and *First Book* (Modern Music Series).

At this time more formal vocal exercises can be given and the range of voice extended, as it is now inclined to be most brilliant in quality. All singing should be light and carefully reinforced, with suitable breathing and physical exercises to avoid straining the fast-maturing vocal organs. The following exercises are suggested by needs of songs: viz., *Patriotic Song* and *Woodpecker* — deep sustained breath to support high tones; *Fireman*, expulsion of breath on "ding-dong;" *Mill-Song*, pouring breath on in steady stream; *Squirrel*, chasing tones with breath. Following these lines, vivid interpretation induces active bodily response on the part of the pupils and corrects bad position.

Advanced Step. Interesting songs with which to help advancing sight-singing at this period are the *Round and Catch*, the familiar folk-ditties known as *The Three Blind Mice* and *Chairs to Mend*, where a distinct melody capable of harmonic repetition is given. This is an excellent device for avoiding the "growling" of a second part, the usual attempt at alto singing without sufficient reading knowledge. These with the two and three-voiced canon make a natural and pleasurable approach to part-singing, and also show the development of the period and simple song form.

The simple classics on general subjects usually introduced into school-music books for this period here serve a good turn. Part-songs in thirds, sixths and octaves can be introduced in connection with these. The importance of part-singing can be emphasized by letting these middle grades sing an alto melody against the other parts in general school-exercises. Interest should be stimulated in general school-singing through the easier American, Scotch, Irish and German folk-songs, of simple emotional content and not too extended range. A list of these would include *Dixie*, *Kentucky Home*, *Tenting To-Night*, *Fir-Tree*, *Lorelei*, *Keel Row*, *Campbells are Coming*, *John Peel*, *Hunt Is Up*, *Wearin' of the Green*, *Canadian Boat-Song*, *Blue-Bells of Scotland* or *Santa Lucia*.

References: *Songs for Schools*, Farnsworth; *Songs Every Child Should Know*, Bacon; *Folk Songs*, Ditson; *Modern Music Series*, Second and Third Books; *One Hundred Rounds*, Boosey and Co.

CONSTRUCTIVE PERIOD

The next cycle of development includes the upper grades and the high school. The character of the work of this period is synthetic, aiming to unify the free investigation of the material of the previous stage.

First Step. From the study of rounds and easier part-singing the pupils should settle into steady and ready sight-singing. This material is easily supplied from the various school-music courses in short, bright choruses and glees, supplying practice in time and interval difficulties, harmonic and key changes. Rapid passages in thirds and sixths may be found in the gay folk-songs and in more elaborate musical compositions, found in the Modern Music Series, Third and Fourth Books; in *Songs of Life and Nature* by Smith; and in other music-readers.

Advanced Step. In order to teach the bass-clef, songs are given with the melody arranged for the boys in the bass, thus introducing them in a practical way to their own realm in music-reading. Pages 136, 150 and 168, Third Book, Modern Music Series, serve to illustrate. McFarren's *Harvest-Home* of this series is a very good illustration of the bass used as an accompaniment to the gay, bright obligato in the soprano. This can only be used where the boys' voices have changed.

Studies in harmony can now be carried forward through the analysis of the hymn and singing in parts. This will aid in the structural understanding of music. Examples used are *America;* the harvest-hymn and processional, *We Plough the Fields; A Mighty Fortress; Crusader's Hymn.*

HIGH SCHOOL

Music in the high school presents difficulties peculiar to this age. Change of voice, increasing self-consciousness, the uneven training and grading as to musical knowledge — all these make high-school work the most difficult and least satisfactory from a musical point of view. For ungraded classes the descriptive unison chorus, sufficiently mature to meet the advanced taste of the pupils, may be used. Among this list would be classed the more difficult national and patriotic songs: *Scots Wha Hae, Minstrel Boy, Marseillaise, Sword-Song, Fatherland Hymn,* Greig, and college and popular songs.

In a well-trained chorus having the brilliant quality of the soprano voices, altos chosen from the medium voices, with a sufficient power in the bass, the more elaborate school-choruses can be attempted in parts. Among these are the well-known favorites: *Soldier's Chorus* in *Faust, Pilgrim's Chorus* in *Tannhaüser, Spinning Chorus* in *The Flying Dutchman* and *The Heavens* by Beethoven, various selections from popular operas, descriptive and national music. The enlarged content of these demands increased vocal ability and power as well as a reading knowledge which is not usually found. *The Laurel Song-Book and Reader* by Birchard may be quoted for these. Where time and interest permit, a correlation with history and literature can be made through such noble songs as are here supplied. The Novello editions of national and folk-songs will also be found useful in illustrating Russian, Scandinavian, Eastern European and other national music.

GENERAL ASSEMBLIES AND FESTIVALS

To keep the spirit of music alive in the school there should be a continual oncoming body of song from all the grades. Anniversaries, national days, seasons and festivals should be the objective point of the musical programs of the year. Less time should be spent on uninteresting exercises for the elucidation of musical theory and more given to the preparation of *ensemble* material for the enjoyment of all. The standard literature of music in choruses, hymns, patriotic and national songs, selections from choral works, even the giving of cantatas, would fairly represent a *public-school*, not a college, course in music. It is not the function of public-school music to produce the finished artist, but to make for common standards of training in the democracy of art, of which our country stands in such great need.

MARI RUEF HOFER.

Schools, El'emen'tary. The conception of elementary education most agreed upon may be said to be that of training in literacy. Such a view refers, of course, to education given in the school as distinguished from that training in manners, morals and skill which is given in the home or by general social intercourse through imitation, apprenticeship etc. It covers the common element involved in those systems where elementary is simply preparatory to secondary education and those in which it is synonymous with popular education or such as is given to the masses. These two types have been differentiated and again united in history in such a manner that a sketch of the rise of popular education is almost indispensable to a comprehension of the problem of elementary education to-day. In the middle ages literary education was confined largely to the clergy and the professional classes. With them it was such training in Latin as would prepare them to understand the church services, legal or medical terms or to read the literature of theology, philosophy, medicine or law. Such training was not supposed to be necessary or even desirable for the mass of the people. The Reformation brought the idea that the Scriptures should be read by all, and also such translations as made it necessary to learn only the modern tongues in order to accomplish this purpose. Popular systems of education began to make their appearance. The Duke of Württemberg adopted a plan for vernacular schools in every village in 1559. This step was imitated by other German states, and in 1619 Weimar decreed that attendance on such schools should be compulsory for the common people. In Holland the Synod of Dort in 1618–9 decreed that elementary schools should be established in every parish. In Scotland an effective system of parish schools was inaugurated in 1696. Massachusetts passed a law in 1647 providing that every town of 50 families should have an elementary school. In France a Catholic order, the *Brethren of the Christian Schools*, established in 1684 by Jean Baptiste de La Salle, emulated the activities of the Protestants in popular education. This order became widely influential, and is notable especially for its system of teaching children in graded classes rather than as individuals. In England it was not until early in the 19th century that two societies, the British and Foreign School Society and the National Society, began the work out of which the English elementary system of to-day has been constructed through the coöperation and, later, the supervision and control of the state.

In its beginning this popular education aimed at religious ends. It in general was very meager, being confined largely to religious instruction and some little training in reading and writing. The great revolutionary social and political movements of the 18th century may be said to have yielded their richest fruit in the reconstruction of these schools. Popular educa-

tion is essentially the achievement of the 19th century. It rests on the notion that education should be universal, that its aim is not merely religious, but rather to prepare for intelligent political activity, a purpose especially emphasized in the United States by Horace Mann, and that the emancipation of the mass of mankind demands not merely power to read and write and some knowledge of politics, but such training as shall insure to each the power to make a respectable if not comfortable living. The last idea may be said to be the special contribution of Pestalozzi, the Swiss reformer, to modern educational doctrine. He perhaps was the most influential man in determining the aims and methods that prevailed in the reconstruction of the system of education in Prussia and other German states in the early part of the 19th century. This movement involved the expansion of the curriculum to include arithmetic, geometry, geography, nature-study, literature, history, drawing, music and, especially, such manual and technical training as seems best adapted to prepare for the vocations of the people of the neighborhood. The eight or nine years' course in the German folk-school may now be supplemented by a course in the continuation-schools, held usually in the evenings or on Sundays and especially offering vocational instruction, or in technical or trade-schools which everywhere abound. Elementary teachers are usually well-trained in the normal schools. All schools have now become state institutions. No one can open a school without official sanction. Practically all elementary instruction is still supported and controlled by public authorities. Careful supervision and inspection exist. Teachers are pensioned on retirement from active service. Compulsory-attendance laws are strictly enforced. Illiteracy has practically disappeared, and efficiency in the various vocations has enormously increased through this system. In France the foundations of the present system were laid by the law of 1833, but it was not until after the Franco-Prussian War that it became highly efficient. The same features exist as in Germany, except that control and support are more highly centralized. The administration at Paris through its officials appoints the elementary teachers, provides their salaries as well as liberal contributions for buildings etc., and inspects the schools. During the last decade nearly all the schools maintained by Roman Catholic teaching-orders have been suppressed, so that elementary education, as in Germany, is practically in the hands of the state. At the same time the French schools, unlike the German ones, pay little attention to religion. In England, also, elementary education has become free and compulsory, supported largely by public funds, inspected and to a great extent controlled by state officials. The religious societies still control the training schools for teachers and many of the elementary schools. The dominance of the Anglican church in elementary education is a source of bitter contention to-day in British politics. As in other European schools, vocational efficiency has come to be a leading object in English popular education.

In the United States the free schools, at the time when Horace Mann undertook their reform (about 1835), were poorly supported and taught and not patronized by those who could afford to pay tuition. As a result of the agitation that he began, the public elementary schools of Massachusetts, hitherto supported solely by the localities, received state aid normal schools (*q. v.*) were established for training teachers, better inspection was provided, the school-year lengthened, the curriculum enriched, and in general the aim that the public school should be made so good that no one would resort to private instruction on account of their inefficiency was realized. Other states quickly followed Massachusetts, and to-day the opportunity to receive an elementary education is practically universal throughout the nation. In general it may be said that about 18 per cent. of the fund for the support of schools comes from the states, while about 68 per cent. comes from local taxes. The state-fund is especially important in sparsely inhabited regions. In New England the unit for the organization and control of schools is the township. In the south it is the county. Elsewhere in the nation the district as a rule is the unit, but a combination of district, county and state control and support exists.

In comparing elementary education in the United States with that in Europe, we notice that it is inferior in completeness of organization, in carefulness of inspection, in compelling attendance, in pensioning teachers and especially in offering technical and trade education. On the other hand American education offers more opportunity for originality and independence both in teachers and in pupils. The elementary school in the United States is not for one class in society but for all. It is not differentiated from the secondary school, but prepares for it as well as for life. Herein is to be found doubtless the reason for the slowness with which elementary technical education has developed. Such training prepares for a special vocation; but our system tends to hand that over to the secondary school, reserving for the elementary school only that preparatory and liberal training that enables one to get some appreciation of the various lines of human culture before entering upon a

course calculated to prepare for a trade, business or a profession. See EDUCATION, HISTORY OF; EDUCATION, MODERN; NORMAL SCHOOLS; SCHOOLS, RURAL and SCHOOLS, SECONDARY. E. N. HENDERSON.

Schools, Ru'ral, are generally called *country* or *district* schools. The term is applied to that class of elementary schools found in agricultural regions or in communities possessing a more or less scattered population. In the United States, at the present time, the rural school is a public school, free to all children of school-age, (which varies in different states, beginning at four, five or six years and extending to eighteen, nineteen, twenty or twenty-one years), of both sexes, residing within a defined territory, — the school-district, the township or the county. Comparatively few instances of such schools being of parochial or private character are known. In the southern states separate schools are provided for the white and negro children. Special schools for Indian children are maintained by the Federal government on Indian reservations.

As ordinarily existing, a rural school is taught by a single teacher, in a building having but one school-room. It is in session from a few weeks each year in the poorly provided and less progressive communities to seven or eight months in the more favored and progressive sections of the country. The time of the year at which the school-session or term is held differs in different regions, being influenced by the character of the climate, quality of roads and occupation of the people. The number of pupils attending a rural school varies between the widest extremes. It is not an uncommon thing, in thinly populated reigons and in sections divided into many districts of small area, to find a school having but a half dozen or fewer pupils. Frequently, however, in the midst of a numerous population, or wherever the school supplies a somewhat larger area, a single schoolroom may serve for forty, fifty or sometimes close to a hundred pupils. Some states have enacted laws which make it necessary to build another school-room and employ another teacher when the attendance of the school reaches a maximum number, say sixty. Through consolidation of schools and the transportation of pupils a widespread movement is going on to decrease the number of small, poorly attended and isolated rural schools, and at the same time to encourage longer and more regular attendance of pupils. While the laws making the attendance of children between certain ages (8 to 14) compulsory, now in operation in thirty-six states and territories, are generally intended to apply to all children, irrespective of whether they live in city or country, for the most part no great effort is made to enforce these laws in the rural districts. The difference between city and country in this respect is shown in a striking manner by the fact that, while the average daily attendance of pupils in village and city schools is seldom below 90 per cent., that of the rural schools is most frequently in the neighborhood of 50 or 60 per cent.

The course of study of the fully organized rural school is usually eight years in length, and is composed of the recognized elementary or common-school subjects, — reading, writing, arithmetic, spelling, English grammar, geography, United States history, civil government, physiology and hygiene. Of recent years some of the more progressive states have added instruction in elementary agriculture, manual training and domestic science. Instead of being a graded school, that is, one made of pupils of nearly the same age and advancement, studying the same subjects together in classes, the rural school in the majority of cases is an ungraded school. In the smallest schools each pupil is a class by himself. In the large schools the whole number of pupils is divided into three or more groups for teaching. By law in most of the states all public schools must be taught in the English language, although in some sections of the country instruction is actually carried on in other languages; for example, in Louisana teaching in the French language is permitted in those localities where the French language predominates and in New Mexico in Spanish where that language is largely employed. While the typical rural school gives instruction of only elementary character, frequently secondary or high-school subjects are included. The establishment of rural and township high-schools and the consolidation of schools, particularly during the last decade, have greatly increased the opportunity of country children for a better and more advanced education.

Organization and Government. All of the public schools of each state are organized into a system. Every public rural school, then, is a state institution and, as such, falls to some degree under the control of a branch of the state government, which is usually presided over by a state superintendent of public instruction or a state board of education. In practice the actual control over any particular school is exercised by school-officers, elected by the people of the locality or chosen by the state educational officials. The local school-officers are known as school-boards, boards of school-directors, boards of education, school-trustees or county superintendents. The method of selection, the powers and the duties of these school-officers vary much in different states. However, it may be said that they act in general under the direction of a state-superintendent or a

state-board of education and under the authority of the laws governing schools passed by the state legislatures. These laws usually prescribe what school-officers there shall be for each school, when and how and for how long and by whom they shall be chosen, the amount of school-taxes to be raised and the manner of raising these, the length of the school-year, the age of pupils, the qualifications of teachers, the subjects to be taught etc.

The important fact to be kept in mind here is that every public rural school is a *state* institution, organized and governed in accordance with the general laws of the state regarding public schools. Though in many instances the people of the community exercise a large influence in determining the character and policy of the school, they are obliged, nevertheless, to act and proceed in the manner prescribed by the laws governing the public schools of the state.

Support. The best definition of a public school is that it is a school deriving its support entirely or in part from moneys raised by a general state or county or other local tax. The principle that all property and all persons may be taxed for the support of public schools may be called one of the most firmly fixed beliefs of the American people, and one that has aided more than any other in the giving of opportunity for education to every American boy and girl. Rural schools as public schools, with very few exceptions, are supported wholly by public funds.

Each state has its own particular plan of providing money to support its public schools. In the main this money may be said to come from one or more of five sources or according to one of five methods: the local school-tax; the state school-tax; the income from the common-school fund; special licenses and fees; and special state aids and appropriations.

The local tax is that levied annually upon the taxable property in any school-district, township or county. The amount of the tax is fixed either by the people themselves, as in the case of many school-district organizations; or by such school-officers as school-boards, school-directors or school-trustees; or by other local officials, as boards of supervisors and boards of commissioners.

The state school-tax is a tax, regulated in amount by the state law, levied by the state officers upon the taxable property in the state and distributed to the different counties, townships or school-districts, generally, on the basis of the number of children of school-age residing therein. Other methods of distribution, as, for example, valuation of property, school-enrollment, school-attendance or the number of schools or teachers, are also used, singly or in combination. Sometimes, as in California, a special state-tax is levied for the benefit of high schools alone.

The permanent school-funds found in most states were formed principally from the sale and rent of public lands that had been set aside for school-purposes. The income on these funds is alone used for the support of the schools of the state, and this income is apportioned to the various schools of the state according to methods similar to those indicated above for the state school-taxes.

In a number of states special forms of revenue are used to aid in the support of public schools. Among these may be mentioned liquor and other business license-moneys, inheritance-taxes, poll-taxes, dog-taxes, certain classes of fines etc.

The last source of support that may be mentioned relates to the appropriations derived from the state treasury in the form of special aid to particular classes of schools, as high schools, manual-training schools, rural and semirural schools, and to schools for which the ordinary means of support are found to be insufficient. These special aids or subsidies, as they may be called, are employed in several states to raise the general standard of public education by stimulating the attendance of pupils and to encourage the people to establish and maintain efficient schools of the kinds indicated. The system of special aids to rural schools is found in but few states, as for example, Wisconsin, Minnesota, Indiana and in some of the more progressive southern states for the special purpose of securing better school-equipment; yet the signs of the times are that it will soon be more widely used to improve these schools and thereby equalize the educational advantages open to the children of the country districts. The most important problem of the rural schools throughout the whole country is the devising of ways and means to increase the amount of support, so that these schools may be placed on a par with the public schools of the villages and cities.

Teachers. No person is permitted to teach in any public school of any state without having first received a teacher's certificate, which may be obtained by passing a written examination or by completing a course of study at a high school, normal school or college. In almost all of the states of the Union one or more normal schools for the special training of teachers for the public schools exist as a part of the educational system. Certain states require that high schools shall give instruction in those subjects that will be of special value to teachers. This provision has a direct influence upon rural schools, because in very many cases the graduates of high schools become teachers in the rural schools. In addition to the high schools, normal schools and colleges, there are numerous institu-

tions under private management with a similar aim. The supply of trained teachers furnished by the different high schools, normal schools and colleges scarcely more than equals the demands from the rapidly growing public schools of cities and villages. As a result of these demands, together with the better salaries and more attractive life in cities and villages, few trained teachers are found in the rural schools. Generally speaking, the great majority of rural school-teachers are young women without any special education to fit them for teaching beyond that provided in the schools they teach or, at the best, by a neighboring high school. In this respect the most of rural schools are not provided with teachers of sufficient skill and training to do the important work to be done. The low and insufficient salaries paid and the uncertainty of securing and holding a situation tend to make the rural teachers' position a hard one. Of recent years some of the more progressive states have established special county-schools for the training of teachers for the rural schools, and others, as Ohio, Pennsylvania, Indiana, Maryland, North Dakota and West Virginia, have also passed minimum-salary laws. Under these laws every public-school teacher must be paid at least a certain monthly salary ($40 to $45), and no board of education or school-district may pay a smaller sum. The question of obtaining trained and expert teachers is the second large and important problem yet to be solved.

Buildings. The old-fashioned, country school-house was constructed of logs, rough lumber, stone or, in some of the prairie-states, even of sod. It contained one oblong-shaped room, about 20 feet wide and 30 long, was heated by a fire-place or stove, and was furnished with rudely made desks and benches for the pupils. It was oft-times very poorly lighted and generally cold in winter and hot in summer. Very little was thought of ventilation and fresh air. Instead of being the best-built and neatest-looking building in the community and surrounded by well-kept grounds, it was more apt to be unpainted and dilapidated in appearance by its broken shutters and windows. In the larger number of cases it was located on the most exposed or least desirable piece of land in the district; hence the school-house surroundings were altogether barren except for the tangled growth of weeds that sprang up during vacations. As one drove through the country the school-house could frequently be picked out as the worst and most doleful-looking of all the buildings. Many of the farmers' barns looked neater and more inviting. Unfortunately many thousand country-school pupils still go to school in buildings of this kind.

However, a great change is taking place, and all over the United States new structures are being built for the rural schools, which are properly and sufficiently heated, ventilated, lighted, provided with furniture and apparatus for school-work and surrounded by shade-trees and neatly kept grounds. It is coming to be recognized that the "little, red school-house" of olden time lacked many things necessary to the health, comfort and progress of pupils and that the pupils of the rural schools are entitled to as good, healthful, useful and beautiful school-buildings as the pupils of the village and city schools. To encourage the erection of better school-buildings in the rural sections a number of states now offer special aid in the way of additional funds. To provide against poorly constructed buildings it is becoming a common practice to require, before any rural school-building is erected, that the plans for it shall be approved by some competent county or state educational officer For the information of parents, teachers and school-boards many states have issued books of plans of model buildings and pamphlets giving in detail the requirements that should be fulfilled, that a child may attend school and not be under unhealthful conditions.

Improvement of Rural Schools. During the past decade many efforts have been made to improve the character of the rural schools; and at present these schools are receiving more attention from the people concerned and from educators, legislators and public men than ever before. That these schools deserve such widespread assistance and improvement is evident. In the main the rural schools are the weakest and least satisfactory, yet at the same time the most important, part of the American public schools. Though exact and reliable statistics are wanting upon the number and attendance of these schools, certain conclusions can be drawn indirectly. In 1905 there were approximately eighty-two and one half millions of people in the United States, of whom somewhat more than half lived in rural districts. During this year there were enrolled in all the public elementary schools of the country nearly sixteen million pupils. It is safe to assume that in the neighborhood of half of these sixteen million pupils attended rural schools. These eight million country-school children are entitled to an opportunity for a complete education equal in degree to that provided in the public schools of the cities and towns. The difficulties to be overcome are many, yet the following movements and reforms are well under way. The first results seem to indicate that the boys and girls who are pupils in rural schools are to have a chance to become really educated men and women; not educated away from the home and the farm but *for* the home and the farm.

Consolidation of Schools and Transportation of Pupils. Just when this reform had its first beginnings is difficult to say; in all probability in Massachusetts where the first law relating to the transportation of pupils to school was passed in 1869. The first experiment of centralizing schools and transporting pupils of which there is any reliable account was made by the school-officers of Quincy (*q. v.*) in 1874–5. From Massachusetts the movement spread slowly into other parts of New England and gradually found recognition in the central and western states — Ohio and Indiana being among the first to accomplish definite results — until no less than 20 states have passed laws permitting the consolidation of schools and the transporting of pupils to a larger central school.

In operation the plan of consolidation and transportation is usually somewhat as follows: The separate, small, one-room ungraded schools within a certain territory are closed, and at some convenient, central spot a suitable new building is constructed of a sufficient number of rooms to accommodate all of the pupils residing within the territory of the closed schools. Even though the new school is centrally located, it will very likely be at too great a distance from the homes of many of the pupils to permit them to walk back and forth to school. The difficulty is met by using wagons to transport the children directly from their homes to school in the morning and back in the evening. The best wagons are constructed after the manner of omnibuses, with covered tops and sides and with two long seats running lengthwise, so that the children enter and leave by a rear door. In cold weather the wagons are heated by small coal-stoves placed near the driver's seat, which also is partially enclosed. Each wagon travels over a definite route, seldom more than five or six miles each day, and conveys from 16 to 20 pupils. Sometimes the wagons are owned by the school-district or the township. More frequently, however, a contract is made with private individuals who furnish wagons, horses and drivers. Frequently similar purposes are accomplished without consolidation in the strict sense. In the case of small district-schools in the vicinity of villages or cities the schools are merely closed, and the pupils are transported as described above to the schools of the village or city. In such instances the cost of tuition is paid by the school-district or township from which the pupils come, many states having made legal provision for this as well as for paying for the transportation.

By the plan of consolidation and transportation, or transportation alone, some of the greater hindrances to education in the rural school, as irregular and unpunctual attendance, poor and unhealthy buildings, insufficiently prepared teachers and absence of proper grading of pupils, — are done away with. Under these plans pupils are enabled to attend school more regularly and punctually and for a longer period of years; better school-buildings, properly heated, lighted, ventilated and equipped, are provided; fewer teachers are needed for the same number of pupils and, with the better salaries possible, more capable teachers are secured. The larger number of pupils in the consolidated school makes it possible to grade the school to better advantage by placing pupils of similar age and advancement in the same classes. Each teacher teaches but one or two classes; hence the work of each class is done more thoroughly and the pupils make more rapid progress. Besides these important advantages the consolidated rural school frequently is able to give the privilege of a high-school education to those pupils who are properly prepared. The experience in states where the plans have been carefully tested indicates that the cost of the consolidation and transportation, or of transportation alone, is but little if any more than education under the old plan. Indeed, very frequently it is considerably less. In fact, it would seem as if the plan offered a way out of a great difficulty; and if the people of the rural communities were to take advantage of them, many thousand country-boys and girls would be able to obtain an education equal to the best that the American schools are able to give.

Conventions of School-Officers. In order to make school-officers, as members of district and township school-boards, better acquainted with their official duties and to increase the general interest in the welfare of the public schools, especially the rural schools, a few states have begun the practice of having these officers in each county meet together once each year. At these conferences, or conventions as they are called, matters of importance are discussed by the members themselves; frequently one or more of the state's educational officers are present to aid in the spreading of information about better schools and how to secure them. Five states, — South Dakota (1901), Minnesota (1903), North Dakota (1903), Pennsylvania (1903) and Wisconsin (1905) — have enacted laws which provide for the paying of the expenses of the school-officers attending the meetings. Before all the children of the rural districts can have the chance of attending good schools, all of the people must be made to feel the need of having such schools. The school-board convention will probably be of great service in the accomplishment of this.

Rural High-Schools. The ordinary rural school is one in which instruction in elementary subjects alone is given. For many

years many of the people of the rural districts have wished that their children might have the same kind of opportunity to attend high schools as the children of the cities have. This has been brought about in many cases by establishing county and township high schools, attendance at which is free to any pupil residing in the county or township, and by providing for the free attendance of country pupils at the high schools of neighboring cities and villages, the school-districts from which the pupils came paying the cost of tuition. A few states have already established county-schools of agriculture and domestic science for those boys and girls who have completed the work of the ordinary district-school. This movement to give a high-school education to country pupils is one of the most important reforms of the present time. So important, in fact, is it that a plan to have the national government make special appropriations for the support of these schools has been prepared and considered by Congress.

Educational Extension. In addition to the efforts to improve and enlarge the opportunity for the education of the pupils of rural communities in *schools*, numerous other plans have been put into operation to give *all* the people of these communities, men and women as well as children, a better chance to become educated. In this connection may be mentioned the placing of libraries in the rural schools; the establishment of the system of traveling libraries; the holding of farmers' institutes; and the forming of farm-clubs, including not only the pupils of the schools but those older boys and girls who have left school for any reason, in order to create a lively interest in the betterment of the crops of the farm. When all these things happen to the rural schools, it may be truthfully said that every American country-boy and girl has the best educational privileges of any boy or girl in the world, and life on the farm will be better than any other life. But not until then.

Bibliography. Of recent years there has appeared in various educational publications and reports and in periodical literature a large amount of material on rural schools. The following brief list gives the latest and best publications upon the rural schools accessible to the ordinary reader: National Educational Association's *Report of the Committee of Twelve on Rural Schools* (1895); *Report of the Committee on Industrial Education in Schools for Rural Communities* (1905); Kern's *Among Country Schools* (1906); Johnson's *The Country Schools* (1907); and Corbett's *Free High Schools for Rural Pupils* (Report U. S. Com. of Ed. 1899–1900, pp. 643–662).

E. C. Elliott.

Schools, Sec'ondary, of to-day may be said to have originated from the Renaissance. At that time there developed in the aristocracy of Europe an interest in polite social life that found satisfaction in a study of the culture of Greece and Rome and especially of classic literature. The secondary schools sprang into existence, having for their aim liberal culture, or culture in the humanities, as distinguished from the religious or spiritual instruction given in the middle ages. They may be typified by the *gymnasia* of Germany; by the so-called "public" schools and the grammar-schools of England, most of which are endowed; by private institutions like that of Vittorino do Feltre in Italy; and by the great system of colleges established by the Jesuits all over Europe. In general they gave a course of from eight to ten years devoted almost entirely to the Latin and Greek languages and literatures. Hebrew was occasionally given, and also a little history, with possibly mathematics, logic and ethics, but these subjects were learned almost entirely through classical texts. The development of modern literature and the disappearance of Latin as the language of science and learning rendered this program somewhat antiquated, but it has to a great extent been retained in the classical secondary schools on the ground of the discipline it is supposed to furnish. (See Mental Discipline.) On the other hand, other types of secondary schools have sprung up, laying stress on modern languages, history and science. In Germany the secondary system of to-day comprises the classical school or *gymnasium*, giving a nine years' course, the scientific school or *realschule*, the course of which is the same in length or shorter, and various intermediate types. The curriculum of the *gymnasium* includes religion, German, Latin, Greek, French, history, geography mathematics, natural history, physics, writing and drawing. The *realschulen* leave out the classical languages and emphasize science and mathematics. In France the colleges of the Jesuits disappeared because of the suppression of the order in 1764. In their place *lycées* and communal colleges have been established. They offer a nine years' course, the early part of which is like that in the German *gymnasium*, but during the last three years the pupil can elect to specialize either in classics, modern languages or science. In England the endowed schools were subjected to a careful state investigation about the middle of the 19th century. The result was the disappearance of many abuses, somewhat better organization and a few steps toward modernizing the curriculum. They, however, remain to-day almost entirely devoted to the classics. Mathematics, history and science are taught, but the historical and scientific instruction is very meager. On the other hand, the

English have come to denominate as secondary education, work in sciences, technology and art now given quite extensively as a supplement to the instruction in the elementary schools. In all these typical secondary schools the ordinary age of admission is nine or thereabout. Children are taught before this age in small private schools or by tutors. Very few go from the public elementary system into the secondary schools. The latter remain, therefore, as throughout history, the schools of the aristocratic and professional classes.

Here it is that the system of the United States has come to differ from that of Europe. For the secondary schools in this country are simply one stage in a continuous system. This result has come from gradual growth, for in the beginning American secondary schools were very much like those of Europe. In colonial days they consisted of grammar-schools, which had about the same purpose and curriculum as the English grammar-schools. Especially were they intended to prepare for college. Later they were largely superseded by the academies, which were under private control, although often endowed. These institutions became centers of educational life in various communities, and besides preparing for college better than grammar-schools had done, they constituted finishing-schools for most of those who attended them. Some of them grew into colleges. Their curriculum came to be much more liberal than had been that of the grammar-schools. English, including grammar and, later, rhetoric and literature, geography, natural philosophy, astronomy and, sometimes, chemistry and botany, algebra, geometry, trigonometry, surveying, navigation and history; and, later, modern languages and commercial branches, as well as the classics, were taught. The academies remain an important factor in the education of the United States, but they have been overshadowed by the high schools, the development of which is due to the growth of the idea that secondary education should be supported and controlled by the public. The first of these schools was established at Boston in 1621. Since then they have spread over all the Union, to-day numbering nearly seven thousand. They are supported and controlled by the local communities where they exist. Most of them are coëducational. The course of study usually takes four years, and pupils enter at about 14. As a rule the student may elect among several courses, which are denominated, according to the leading subjects of study in each, as classical, literary, scientific, Latin-scientific, modern-languages or commercial. In recent years there has been some agitation concerning the length of the high-school course. Some would have it cover six years, embracing the work of the last two years in the elementary schools. Others would have it encroach on the college; and graduate, high-school work is actually undertaken in some places, especially where the local facilities for college education are poor. The high schools have been compelled to do very efficient work in college preparatory subjects by the pressure of college demands. In many states, especially in the west — they are inspected by the university authorities, and, if found satisfactory, their graduates are admitted to the university without examination. Thus a system of inspection has grown up, the main one found in the United States for secondary schools. The complaint has become general, however, that high schools are dominated too much by the colleges, so that they aim merely to prepare for the latter and neglect the interests of that vast majority who do not go to college. To-day the tendency is for the high school to become more independent, even to the extent of compelling the college to accept *their* standards of graduation as qualifying for entrance. Many high schools have been organized to give technical or commercial education. In most cases, however, these schools have simply added the vocational training to a fairly liberal, secondary-school course. Future developments in secondary schools will doubtless comprise far more adequate provision for technical and trade education. In general it may be said that the high school is in a difficult situation, struggling on the one hand with its tradition of classical, disciplinary and aristocratic education and on the other with the democratic demand that it should provide a secondary education suitable for all, taking its students from an independent elementary system and coerced by the need of preparing them for college. It is coming to realize that the solution lies in more independence both in regard to tradition and to other schools. See EDUCATION, MODERN; MENTAL DISCIPLINE; SCHOOLS, ELEMENTARY; and UNIVERSITIES.

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Schools, Sum'mer. This term applies either to institutions whose sole purpose is to give instruction during the summer-months (especially July and August) or to the summer-session of any institution of learning. One of the most popular types of the former class in America is that modelled after the Chautauqua ideal of meeting at some place favorable for summer resort and combining study with recreation and entertainment. Here the majority of students take advantage of the popular lectures, concerts and entertainments; a smaller number pursue progressive courses in literature, philosophic or scientific subjects; and a few take advantage of the opportunity to receive advanced instruction in

special branches. Among the summer-schools of the universities that of the University of Chicago is unique in having the regular work of the entire university carried on during the summer-quarter (twelve weeks) as during any of the other three quarters of the year. The various universities allow credit towards a degree for the work done during the summer-session, so that teachers who cannot give up their positions are thus enabled to carry on work resulting finally in the securing of a university degree. Recently a considerable number of summer-schools for the pursuit of some branch of natural science have been located at places suitable for their particular purposes. Another important type of summer-school is that for the professional training of teachers.

Schools for Defect'ives. Defectives may be conveniently grouped into the classes of the deaf, the blind, the deaf and blind and the feeble-minded or idiotic. It is only within the last 60 or 70 years that much attention has been given to their education and care as a special class, but they are now generally cared for both in this country and in Europe in special schools maintained by the state. Under such instruction the majority become self-supporting, particularly the deaf and the brighter ones of the feeble-minded class.

In the case of the deaf the chief difficulty is to teach them the use of language without the aid of sound. For this purpose the three chief methods that have been used are that of *sign-language*, in which a separate sign is made to represent each different object or idea; that of the *manual alphabet*, in which our ordinary letters are symbolized by signs made on the fingers; and *the direct, intuitive or oral method*, in which the pupils learn to understand oral language and to speak it by watching the movements of the teacher's lips in speaking and by imitation of the movements of the vocal organs. The oral method is difficult, but in many cases excellent results have been secured by it. Most schools use a combination of several methods. Among private schools for the deaf the Wright-Humason School in New York is one of the best.

The first American schools for the blind were those of New York, Boston and Philadelphia, established about 1833, in each instance through private capital and enterpise. It is very important that the teaching of blind children should begin at an early age, lest the natural development of the mind be hindered through lack of activity Here, also, various methods of teaching have been employed. Reading from embossed print has now been largely superseded by an alphabetical system of dots instead of letters, devised by the blind themselves. This system is easier to read by touch and easier to write than the letter-system. Recent inventions have made possible the rapid production of whole libraries for the blind in this latest *braille* system. The National Printing House for the blind at Louisville, Ky., keeps a large supply of books on hand. The task of teaching the blind is much easier than that of teaching the deaf and dumb.

There have been some remarkable instances of the successful teaching of the deaf-blind, particularly the cases of Laura Bridgman and Helen Keller.

Of the feeble-minded there are all varieties and gradations, and some can be helped or entirely cured by proper surgical treatment. They should always be separated from the insane. Some are incapable of much instruction and cannot be made self-supporting. In general the feeble-minded person lacks initiative and controlled and purposive action. Industrial and kindergarten training are each found very valuable for all classes of defectives.

Schools of Com'merce. Commercial education in the United States is conducted by four classes of institutions: private business and commercial schools; public high schools; endowed schools, which often have an industrial as well as a commercial bias; and colleges and universities. The need for special commercial education increases with the complexity of modern business methods. It is felt in the secondary more than the primary school. Elementary education is much the same for all; but the secondary school may tend to prepare exclusively for the college and not for a business vocation. The need of secondary commercial schools was met by their establishment in Vienna as early as 1754, in Brussels in 1834, Trieste 1877, Leipzig 1898, Aix-la-Chapelle 1900, Cologne 1901, Frankfort 1901, Milan and Lorraine 1902. In 1904 the enrollment at Cologne showed 778 students, at Frankfort 546 and at Leipzig 395. A higher commercial school opened at Tokio, Japan, in 1885; and another at Kobe in April, 1903. Japan also has commercial schools graded A and B according to the difficulty of the curriculum. In 1904 there were 48 of these schools, at which children of an age of not less than ten years, provided that they have finished a four-years' course in the ordinary primary schools, are allowed to attend. In Germany there not only are commercial schools, such as have been mentioned, and *realgymnasien* in which modern subjects are emphasized but even commercial universities at Aix-la-Chapelle, Frankfort, Cologne and Leipzig. These universities have 2,841 students, of whom 1,015 are matriculated. In American colleges and universities in 1904 there were 1,537 regular students of commerce in all. Courses in commerce were attended by 6,835 men and 5,430 women.

The report of the Commissioner for Education in the United States in 1904, founded upon information received from 4,602 different institutions, shows that for the scholastic year 1903–04 there were enrolled 250,231 students in business or commercial studies. This was an increase of 6,710 over the preceding year. The regular business-schools had an enrollment of 138,363; the public high schools had 85,313 in business-studies; the private high schools and academies had 13,479; the normal schools 3,255; and the universities 9,821 students in commercial branches. These numbers may give an exaggerated impression of the efficiency of commercial education in the United States, for it is to be recollected that many of the students included may have studied one business or commercial subject only, and that as an extra. American private business and commercial schools were in the field early in the 19th century; they, however, are generally small and utilitarian in their aim. Public high schools endeavor to maintain broader educational aims; and are usually content to offer courses in bookkeeping, typewriting and stenography as electives. Separate high schools of commerce exist and are successful in New York City and Washington, D. C. Several high schools offer a commercial course which may extend over one, two, three or four years; for example, some of the high schools of Boston, Pittsburgh, Omaha and Philadelphia. Among the more important, endowed, secondary institutions which carry on commercial education should be mentioned Pratt Institute, Brooklyn, and Drexel Institute, Philadelphia. About one hundred normal schools invite commercial students. Colleges of commerce have been established in the universities of Pennsylvania, California, Chicago, Dartmouth, Illinois, Michigan, Wisconsin, Louisiana, Vermont, West Virginia, Nevada and Wyoming. See Dexter's *History of Education in the United States*, pp. 415–23.

Schoon'er. See SHIP.

Schopenhauer (*shō'pĕn-hou'ĕr*), **Arthur,** a German philosopher, was born at Dantzic, Prussia, Feb. 22, 1788. He studied at Göttingen, Berlin and Jena, hearing Fichte and Schleiermacher. From Weimar, where his mother resided, he went in 1814 to Dresden and from there to Italy, afterwards living at Berlin and Frankfort-on-the-Main. His chief book, *The World as Will and Idea*, gives a large part of his peculiar philosophy. *On the Will in Nature* and *Sight and Colors* are among his philosophical writings, which include many occasional papers and his prize-essay in the Norwegian Academy on *Freedom of the Will*, which brought him the first public praise. He died on Sept. 21, 1860. See *Lives* by Zimmerman and Wallace.

Schreiner (*shrī-nĕr*), **Olive,** whose pseudonym is Ralph Iron, was born about 1860 in Basutoland, South Africa, where her father, a German Lutheran clergyman, was a missionary in the service of the London Missionary Society. Her mother, however, was an English woman. In 1894 she married S. C. Cronwright. In 1883 she published *The Story of an African Farm*, a story of Afrikander life, replete with simple but forceful and fascinating pictures of South Africa and its peoples. *Dreams*, *An English South African's View of the Situation* (1899) and *Trooper Halket* are other publications of hers. Her husband and she also are joint-authors of *The Political Situation* (1895). Her judgments as to this and as to the Transvaal difficulties are those of one who, though half English, appreciates and sympathizes with the native Dutch of South Africa. Her home is at Hanover, Cape Colony.

Schubert (*shōō'bĕrt*), **Franz Peter,** a celebrated musical composer, was born at Vienna, Jan. 31, 1797. Before he was 11 years old he was singing in a church-choir, and was soon sent to the chorister's school of the court-chapel, where he became leader of the school-band. *The Erl King*, his immortal song, was composed when only 18, and the *Mass in F* while teaching in his father's school at Lichtenthal. In 1819 one of his songs, *The Shepherd's Lament*, was given at a concert at Vienna, and his comic operetta, *The Twins*, was produced at the theater there. As his songs became known, the enthusiasm with which they were received made publishers ready to accept his manuscripts, and as many as 20 songs were published in eight months. He made a tour with Vogl in 1825, delighting everyone with the performance of Schubert's seven songs from the *Lady of the Lake*, though the songs were afterward sold for only $100. He gave his first and only concert in Vienna in 1828, which was so successful as to put the needy composer, who had been selling some of his best songs at a penny, beyond want for a time. His musical productions are very numerous, as he wrote rapidly and steadily, sometimes composing six or seven songs in a morning. Everything he saw, heard or read suggested a subject; one of his piano-duets was inspired by the song which he heard sung by a Hungarian girl as he passed the kitchen door, and his *Hark! Hark! the Lark* flashed over him in a beer-garden. His songs are among his finest work, Beethoven, who saw them only on his death-bed, saying: "Surely Schubert has the divine fire." His compositions include more than 500 songs, ten symphonies, six masses, several operas, cantatas and a host of sonatas. He died on Nov. 19, 1828. See *Life* by Frost.

Schumann (*shōō'män*), **Robert,** a German musician, was born at Zwickau in Saxony, June 8, 1810. He began his musical studies in Leipsic, and in his haste, besides con-

stant practicing, tried some mechanical means for increasing the power of his hands, which resulted in a permanent injury to the right hand and compelled him to turn his attention to composition. For ten years he edited a musical journal, composing at the same time some of his best pianoforte works. Mendelssohn's coming to Leipsic in 1835 resulted in making it the musical center of Germany, and Schumann at once was one of his worshipers. His last years, in which he produced some of his best works, as the *Quintette* for pianoforte and strings, *Paradise and the Peri*, *Genoveva* etc., were clouded by brain-trouble, ending in insanity. The last two years of his life were spent in a private asylum near Bonn, where he died on July 29, 1856. His wife, a fine pianist, labored incessantly to have his works acknowledged, performing them in the chief cities of Europe with gratifying success. She lived to see him ranked among the great composers. See *Life* by Wasielewski.

Schumann-Heink, Ernestine (1861), a noted German contralto singer (family name Roessler), was born at Lieben, near Prague. A pupil of Marrietta Von Leclair, with whom she studied at Gratz, she afterwards made her début at Dresden in *Il Trovatore*, and appeared also at Hamburg and at Baireuth, where she sang in opera and especially distinguished herself in *Der Ring Des Nibelungen*. In 1883 she married Herr Heink, and ten years later she became the wife of Paul Schumann. In 1898 Mde. Schumann-Heink came to this country, where she became a favorite, alike of audiences and musical critics, for her singing both in opera and at concert.

Schur'man, Jacob Gould, American educator, president of Cornell University, was born at Freetown, Prince Edward Island, Canada, May 22, 1854, and was educated at Acadia College, Nova Scotia, graduated at London University, and pursued his studies at Paris and at Edinburgh, Scotland. He also took special courses at Heidelberg, Berlin and Göttengen, and on his return to Canada became professor of philosophy and English literature in two of the colleges of the Canadian maritime provinces. In 1886 he was appointed Sage professor of philosophy and dean of Sage School in connection with Cornell University. In 1892 he became president of Cornell, and at the same time edited *The Philosophical Review* and *The School Review*. In January, 1899, he was nominated by President McKinley as chairman of the Philippine commission, and given temporary leave of absence from Cornell. He is the author of *Kantian Ethics*, *Ethics of Evolution*, *The Ethical Import of Darwinism*, *Belief in God*, *Agnosticism and Religion*, *The Genesis of the Critical Philosophy*, *Philippine Affairs* and *Retrospect and Outlook*.

Schurz, Carl, was born in Liblar, Germany, near Cologne, March 2, 1829. His father was the schoolmaster of the village and was eager to give his boy as good an education as his frugal means would allow. He attended the gymnasium at Cologne, and, though compelled for financial reasons to leave before graduation, he succeeded in gaining entrance at the University of Bonn at 17. While at Bonn he came under the influence of Gottfried Kinkel, a professor of literature and rhetoric, who was earnestly devoted to the revolutionary movement of Europe. Under his influence he took part in the German revolutionary movement of 1848. When this collapsed, Kinkel was condemned to life-imprisonment at hard labor, and Schurz very narrowly escaped and concealed himself in Switzerland. Schurz could not rest until he had, by an almost unequalled feat of daring and skill, liberated his former instructor. He then fled to England where he remained for a short time, afterwards going to France. He kept in close touch with the revolutionary movement, and was a personal friend of Mazzini and Kossuth. In 1852 he came to America, and for fifty years played an important rôle in American political affairs. He was an officer in the Union army, and in recognition of his worth Lincoln made him ambassador to Spain. He soon resigned, however, to take a more active part in the war. He was promoted to major-general and took part in the battles of Second Bull Run, Chancellorsville, Gettysburg and Chattanooga. He entered journalism after the war and in this field won great distinction. Mr. Schurz was editor of *The New York Evening Post* and a contributor to *Harper's Weekly*. He was senator from Missouri (1869–1875) and secretary of the interior during Hayes' administration (1877-81), and always was an ardent supporter of the Republican party until it began to take up what seemed undemocratic principles. Mr. Schurz always was a strong supporter of Civil Reform, and was made president of the National Civil Service Reform League from 1892 to 1901. After the Spanish War he was one of the strongest opponents of the imperialist policy. As a political orator he exerted great influence. Most important among his publications are his *Life of Lincoln*, *Henry Clay* in the American Statesmen Series, *Eulogy on Charles Sumner* and his *Autobiography*. His death occurerd on May 14, 1906.

Schuyler (*skī'ler*), **Philip John,** an American general, was born at Albany, N. Y., Nov. 22, 1733. He served in the French and Indian War, was a member of the colonial assembly from 1768 and of the continental congress of 1775, and one of the first four major-generals of the Revolutionary army. He was preparing to invade Canada as head of the northern department of New York, when his health obliged him to give up the command to General Montgomery, and in 1779 he resigned his office, though remaining

one of Washington's most trusted advisers. He made treaties with the Six Nations, and was state senator for 13 years, United States senator for two terms and surveyor-general of the state from 1782. He was one of the leaders of the Federal party in New York, and helped to prepare the state's code of laws. He died at Albany, Nov. 18, 1804. See *Life* by Lossing and *Philip Schuyler* by Schuyler.

Schuylkill (*sköl'kĭl*), a river of Pennsylvania, rising in the coal-region near Pottsville and flowing 130 miles southeast into the Delaware at Philadelphia, to which it furnishes its water-supply. Coal-barges ascend the river by the help of dams and locks.

Schwatka (*shwŏt'kä*), **Frederick,** an American arctic explorer, was born at Galena Ill., Sept. 29, 1849, and died at Portland, Oregon, Nov. 2, 1892. In 1871 he graduated from West Point, receiving a commission as lieutenant of cavalry in the United States army, which he resigned in 1884. Early in his career he became interested in arctic exploration and in the fate of Sir John Franklin. In 1878 he joined an expedition for King William's Land. This party returned two years after, having discovered and interred many of the skeletons of Franklin's crew and, in some degree, solved the mystery of that explorer's fate, bringing home interesting relics of Franklin's outfit. On this expedition the party made a sledge-journey of over 3,250 statute miles — the longest on record. Later Schwatka explored the course of the Yukon in Alaska, and in 1886 he commanded the New York *Times* Alaskan expedition and ascended Mt. St. Elias 7,200 feet. He sought also in northern Mexico for remains of Aztec civilization. He published *Along Alaska's Great River, A Nimrod of the North, Children of the Cold, The Franklin Search* etc. See Gilder's *Schwatka's Search.*

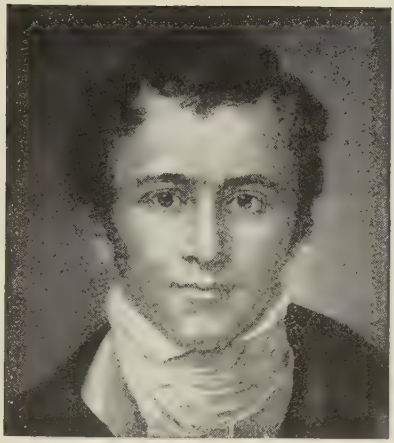
Sci'ence. To know a truth in its relation to other truths is to know it scientifically. For example, when one understands that the change of night and day depends upon the apparent daily motion of the sun, he has mastered a scientific truth which thinking-minds have known from time immemorial. By summing up every-day experiences like this man has been led to the belief that natural events follow each other in an orderly and connected way. To investigate this orderly connection is the aim of all science. The method in use is called the scientific method, and is that of observation and experiment. In this way great laws are deduced, or thought to be deduced, for history shows that the scientific beliefs of one age are time and again overthrown by the scientific discoveries of a later age. Great principles which lie at the foundation of all science have, however, been certainly determined, and especially have great advances in scientific knowledge been made in the last century. The different divisions of science have been grouped in different ways by Comte, Herbert Spencer and others. The most general division is into physical sciences, which have to do with matter and force; biological sciences, which consider the laws of life; and psychical sciences, which deal with the phenomena of the mind. Religion, agriculture, politics and arts as truly are sciences as are geology and astronomy. But science is often used popularly to mean the physical sciences alone. See Jevons' *Principles of Science.*

Scil'ly Islands, a group on the southwestern coast of England, 27 miles southwest of Land's End. There are six large and about 30 smaller islands, and many rocks and ledges. Tin is found in small quantities. Athelstan conquered the islands in 938, and put some monks on Tresco, where are still seen the ruins of their abbey. Queen Elizabeth leased the islands to Sir Francis Godolphin, in whose family they remained for 250 years. The star-castle on St. Mary's island was built by him, and the village of Dolphin on Tresco owes its name to the family. In 1834 they were leased to Augustus John Smith and in 1872 to his nephew. There are lighthouses on several of the islands, but wrecks were formerly common, one of the most noted being that of Sir Cloudesley Shovel's fleet in 1707, when 2,000 men were drowned. The principal industry is the cultivation of the narcissus and other lilies, 100 tons of flowers being shipped in a single spring. The mackerel-fishing in May and June is extensive, a daily steamer carrying away a cargo of 100,000 fish. See White's *Week in the Isles of Scilly.*

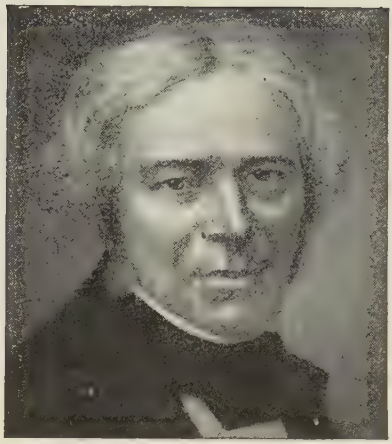
Sciop'ticon. See MAGIC-LANTERN.

Scioto (*sī-ō'tō*), a river in southern Ohio. It rises in the northwest of the state, flowing east and south to the Ohio, which it enters at Portsmouth. It is 300 miles long, and is a feeder of the Ohio and Erie Canal.

Scipio (*sĭp'i-ō*), **Publius Cornelius,** called Africanus Major, a Roman soldier, was born in 237 B. C. He saved his father's life at the battle of Ticinus (218) and was also in service at Cannæ. He was so popular that he was elected to the Roman office of *ædile* before he was of legal age, and was chosen a "general extraordinary" for Spain by acclamation, a choice which his victories in that country, which gave the whole state to the Romans, proved wise. He succeeded in having the war carried into Africa, thus compelling Hannibal to leave Italy, and defeated him at Zama, Oct. 19, 202, thus ending the long struggle between Rome and Carthage. He was received in triumph at Rome, the title of Africanus given and the positions of consul and dictator for life offered, which he refused. With his brother he won the great victory of Magnesia over Antiochus, and when his brother was prosecuted for receiving bribes from Antiochus and condemned, he rescued him from prison.



Sir Humphrey Davy



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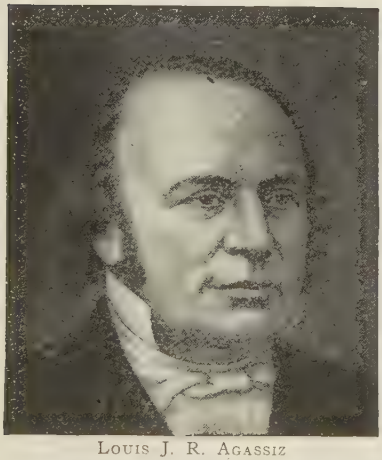

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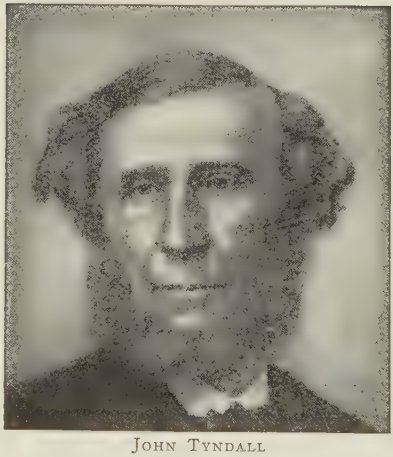

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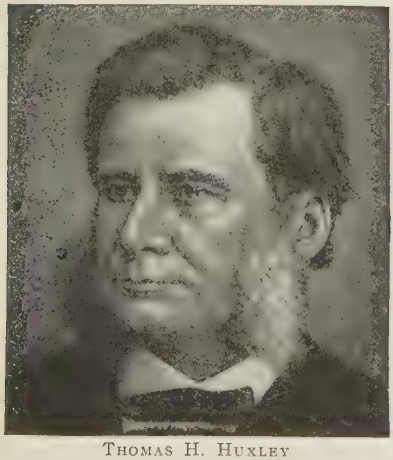
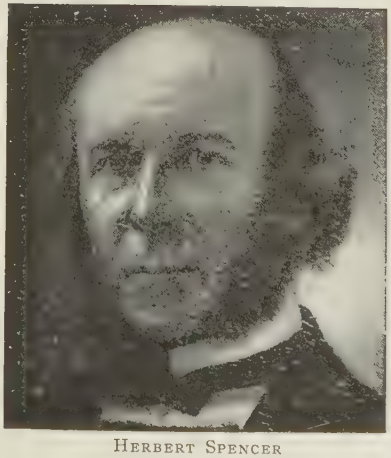


Thomas H. Huxley



Herbert Spencer

GREAT SCIENTISTS

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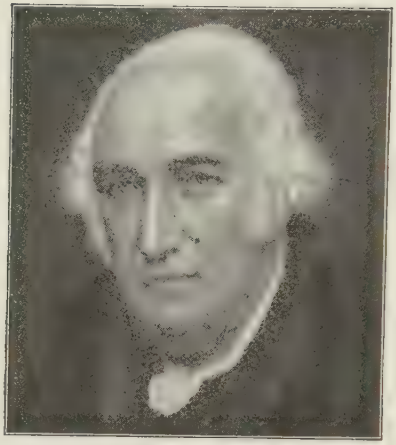
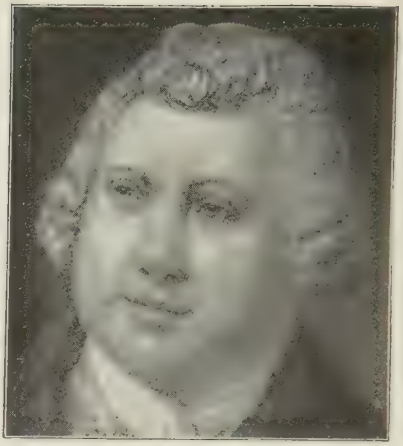
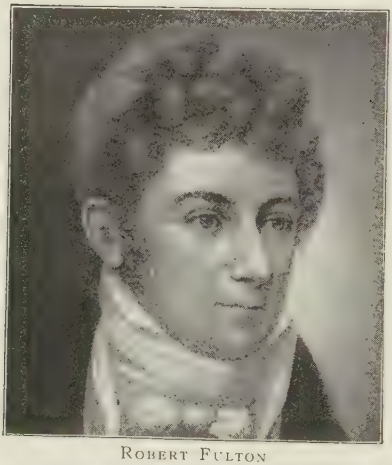


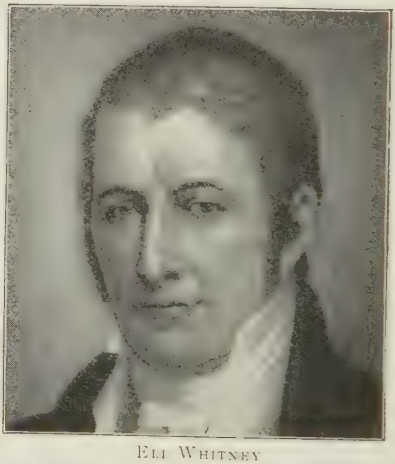
JAMES WATT



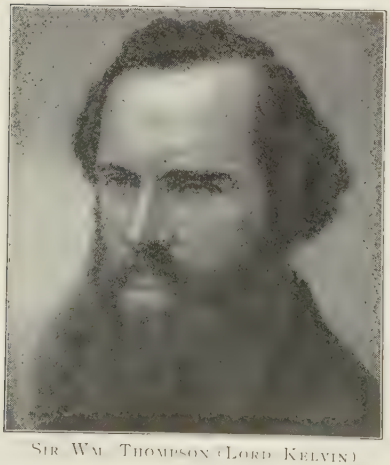
SIR RICHARD ARKWRIGHT



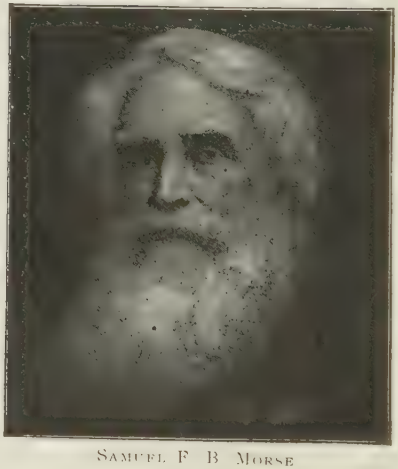
ROBERT FULTON



ELI WHITNEY



SIR WM. THOMPSON (LORD KELVIN)



SAMUEL F. B. MORSE

GREAT INVENTORS

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Later, charges were brought against Scipio himself, which he did not deign to notice, but on the first day of his trial told the story of his victories, and on the second day reminded the people that it was the anniversary of the battle of Zama and a time to give thanks to the immortal gods. In the popular excitement that followed the prosecution was ended. His daughter was Cornelia, the mother of the Gracchi. He died at his country seat in Campania about 183 B. C.

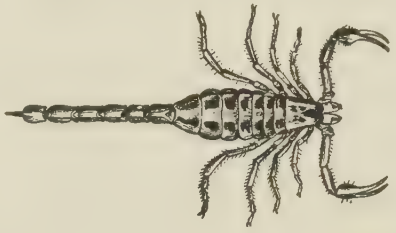
Scipio, Publius Cornelius, called Africanus Minor, was born 185 B. C. He was the son of Lucius Æmilius Paulus, the conqueror of Macedon, but was adopted by Publius Scipio, a son of the great Scipio. He fought with his father at Macedon, went to Spain as military tribune, and in 149 B. C. laid siege to Carthage. He was elected consul in 147. In 146 he took Carthage by storm, and obeyed with sorrow the harsh order of the senate to raze it to the ground and plow its site. As he gazed on the ruin, the thought of the possible destruction of Rome flashing over him, he quoted the words of the *Iliad:* "The day shall come when sacred Troy shall perish, and Priam and his people shall be slain." In 142 he was censor, in 139 an ambassador to Egypt and Asia, and in 134 he was re-elected consul. The contests in Spain tried the best skill of the Roman generals, until in 134 Scipio was sent to Spain, and, after an eight months' siege of Numantia, destroyed the city. In the political troubles at Rome Scipio angered the reform party by interfering for the Latins whose lands were being seized in the haste to carry out a new measure, and he was found dead in bed in 129 B. C., doubtless murdered by some member of the party.

Sclerenchyma (*sklē-rĕn'kĭ-mȧ*) (in plants), a tissue whose cells have walls uniformly thickened. These cells usually are more or less elongated, and a common form is fibrous. Sclerenchyma is a mechanical supporting tissue and is generally developed wherever strength is needed. It is very commonly associated with the vessels, forming the so-called fibers of the fibrovascular bundles. It is also frequently developed in the cortex, either in strands or in bands.

Scol'lard, Rt. Rev. D. J., Bishop of Sault Ste. Marie, was born in Ennismore, Ontario, Nov. 4th, 1862. He entered St. Michael's College, Toronto, in November of 1882; was class-leader during his whole classical course, taking Elmsley Scholarship in 1885 and Campbell Classical Medal in 1886; and graduated with honors in 1887. He entered Sulpician Grand Seminary at Montreal in September, 1887, became bachelor of divinity in 1889 and obtained the degree of licentiate in sacred theology in 1890, and graduated in December, 1890. He was ordained on December 21st, 1890, appointed assistant-priest at St. Peter's Cathedral, Peterboro, Ontario, in 1891, and made bishop's secretary and chancellor of the diocese of Peterboro in April, 1893. He was appointed pastor of St. Mary's Church, North Bay, Feb. 16th, 1896, and was in charge of this parish until appointment as bishop of the new diocese of Sault Ste. Marie on Sept. 21st, 1904. He was consecrated bishop on Feb. 24th, 1905.

Scone (*skōōn*), a town in Scotland, two miles north of Perth, on Tay River, celebrated as the place where the Scottish kings were crowned from 1153 to 1458. The Stone of Destiny, on which the kings were seated, was carried off in 1296 by Edward I. See Urquhart's *History of Scone.*

Scor'pion, the common name for any member of the natural order of jointed



SCORPION

animals called *Scorpionida.* These animals are united into a class with the spiders. They have long, slender bodies and resemble in a general way the small lobster. The head and thorax are joined into a single division, but the long abdomen is plainly jointed. It is divided into two portions: a broad part of seven joints and a more slender, tail-like part with five joints. The latter is terminated by a sting, and is carried arched over the back of the animal. The thorax bears four pairs of walking-legs. The most prominent appendages are the pedipalps, which extend forward and end in broad claws. Scorpions are restricted to warm countries. They range in length from two to eight inches. Small kinds are common in the southern portion of the United States. During the day they lie concealed under stones and in holes, but they are active at night. Their food is insects, spiders and other small animals. They are able to inflict a severe wound with their sting, but it is rarely if ever fatal.

Scot'land is one of the political divisions forming the British Empire, and is the northern part of Great Britain, surrounded by the ocean on all sides except the south, where it touches England. It is 274 miles long and from 24 to 146 miles wide, including 29,796 square miles, which makes it about as large as Indiana. The coast of 3,000 miles is deeply indented, so that very few places are more than 40 miles from the sea, and there are 186 islands, mostly in the

Hebrides, Orkney and Shetland groups. Solway Firth, Liddel and Tweed Rivers and Cheviot Hills separate Scotland from England. The rivers, flowing mostly to the sea, are not large, the Clyde of 106 miles being the longest. The Tweed, Forth, Tay and Dee are well-known, as are also the beautiful fresh-water lakes of Loch Lomond, Loch Katrine, Loch Leven etc. The division of the country into Highlands and Lowlands is rather a division of race than of country, for, though the Highlands include the more mountainous parts of the country, they have rich, level tracts, while there is hardly any part of the Lowlands without mountains. The Highlands are that part of the north and northwest of Scotland where the Celtic language and customs still linger, and include the Hebrides, but not the Orkneys and Shetlands, where the people are of Norwegian origin. There are nearly 200 mountain-peaks in Scotland over 3,000 feet in height, the highest being Ben Nevis, 4,406 feet. The northern Highlands, the Grampians and the Cheviot Hills, with their beautiful glens and mountain lakes make the famous scenery of Scotland. The nearness of the ocean tempers the climate, so that the thermometer rarely falls to zero in winter or rises above 80° in summer. The animals and plants resemble those of England. About half of the birds are waterbirds, and fish, especially shellfish, abound. The country is not well-adapted to agriculture, because of its cool summers, late springs and heavy rains, but it is carried on with great care and the use of the most improved methods; and in the wildest mountain-regions sheep graze. The fisheries form an important industry, especially the salmon, herring, cod and ling. The salmon is so abundant that before it was sent to England in large quantities, servants used to make a condition that they should not be fed upon it more than three times a week. The principal minerals are coal, iron known in the United States as Scotch pig, lead, granite, sandstone and other fine building-stones. The linen, cotton and wool manufactures are large, and there are silk, hemp, hosiery, hats, leather and soap factories and large breweries and shipyards.

Scotland, since its union with England, sends 16 peers to the house of lords and elects 72 members to the house of commons. It has its own courts and its state religion, which is Presbyterian. Its common-school system, going back to 1695, made the Scottish people of the 18th century the best educated in Europe. There are four universities, Glasgow, Aberdeen, Edinburgh and St. Andrews.

The early inhabitants were the Picts, a collection of Celtic tribes, and by the Romans the country was called Caledonia. The Scots were a tribe from Ireland, then called Scotia, who settled on the western coast of Caledonia, and the kingdom of the Picts and Scots seems to have been first called Scotland in the 10th century. There are 38 Pictish kings mentioned in early Scotch history. The Saxons settled in the lowlands in 449, and one of their leaders, Edwin, founded Edinburgh (Edwin's burgh). The introduction of Christianity into Scotland by Irish missionaries dates back to the 6th century. In the 9th century the Scots became the leading power in the country, and the government was in the hands of Prince Kenneth Macalpin. The first great battle of Scottish princes on English soil was fought in 937 between Constantine their king, aided by the Danes, and Saxon King Athelstan. During the réign of Malcolm, the son of Constantine, Edmund, king of England, restored to that prince a part of the Cambrian kingdom, which Edmund had wrested from the Britons, and this grant was the pretext for the claim of homage from the Scottish rulers, made by the English kings for so many years. Malcolm II, Duncan and Macbeth, a usurper, the next three kings of Scotland, are well-known through Shakespeare's tragedy. Malcolm III defeated Macbeth in 1057. His wife was Margaret, the sister of Edgar, the Atheling of England, and her influence and that of his own life in England led to the introduction of English customs; while the tyranny of William the Conqueror drove large numbers of the Saxons into Scotland. The three sons of Malcolm who succeeded him, Edgar, Alexander and David, continued their father's policy; David was to Scotland what Arthur was to Britain. He established Norman, English and French colonies, introduced a system of written law, and placed the religion of the country on a new basis, providing for the support of the clergy and the building of churches. His grandsons, Malcolm IV and William the Lion, and Alexander II, the son of William, bring the list of Scottish kings to Alexander III, one of the ablest and best of their rulers. His sudden death in 1286 ended the period of Scotland's prosperity that had lasted for 400 years. The struggle for the succession between Balliol and Bruce and the ambition of Edward I of England, who had conquered Wales, to add Scotland to his kingdom, brought in the series of conflicts under Wallace and Bruce, ending in the battle of Bannockburn.

Robert I (Robert Bruce) was succeeded by David, his infant son, and his grandson Robert, who, as Robert II, heads the list of the Stuart sovereigns of Scotland, which numbers fourteen; an unfortunate race, including Robert II; Robert III, who died of grief, with his older son murdered and his younger son an English captive; James I, for eighteen years a prisoner in England and finally murdered; James II, killed in battle; James III, murdered with his son in rebellion against him; James IV, killed at Flodden; James V, who died broken-hearted at the

rout of Solway Moss; Mary, twice a widow and twenty years a captive, beheaded at Fotheringay Castle; and James VI of Scotland and I of England. The feuds of the powerful nobles of Scotland and the struggles with England kept the country in a state of turmoil. In 1503 James IV married Margaret of England which finally resulted in the Union of the two kingdoms. Under James V religious struggles added to the troubles of the country, and James VI became king of England on the death of Elizabeth in 1603.

The Scotch parliament met for the last time in 1706. The leading statesmen of both Scotland and England felt that nothing but a complete union of the two countries would bring about permanent peace, and, though opposed by a majority of the people, the Scottish parliament passed the Act of Union on Jan. 16, 1707. The union was unpopular in Scotland for many years, but with the evident prosperity of the country under the new arrangement discontent gradually disappeared; though Scotland and England are still two countries, and a Scot abroad, if asked if he is an Englishman, will seldom answer "yes." The Gaelic language used in the west and north of Scotland is a Celtic dialect, while the Lowland Scotch is a form of the Saxon, being the same as the northern English of Northumbria. The dialects are many, classed as Border Scotch, Central Scotch and Northeastern Scotch. The chief cities of Scotland are Edinburgh the capital (population 345,747), Glasgow (847,584), Dundee, Aberdeen, Leith, Paisley and Greenock. Population 4,472,103. See BRUCE, ENGLAND, GREAT BRITAIN and MARY STUART. See *Scotland under Early Kings*, by Robertson; *Scotland as It Was and as It Is*, by Argyll; *Scotland from the Earliest Century to the Present Time*, by Mackintosh.

Scottish Literature. See LITERATURE, ENGLISH.

Scott, David, a Scottish painter, was born at Edinburgh, in October, 1806. He was an apprentice of his father, an engraver, but turned his attention to painting, exhibiting his first picture in 1828. He studied at Rome, there painting his *Vintager*, now in the National Gallery. Among his best-known works are the illustrations of the *Ancient Mariner* and *Pilgrim's Progress* and the paintings of *Nimrod, The Traitor's Gate, Queen Elizabeth at the Theater* and *Vasco da Gama Encountering the Spirit of the Cape.* He died on March 5, 1849. See W. B. Scott's *Memoir.*

Scott, Duncan Campbell, was born in 1862, educated at Stanstead College (Quebec), and joined the Canadian Civil Service at Ottawa in 1879 and quickly received promotion. His short stories and poems have appeared in the best magazines. He is an editor of historical biographies now being published.

Scott, Sir **Walter,** the Scottish novelist, was born at Edinburgh, Aug. 15, 1771. He became lame as the result of a fever when an infant. At Edinburgh University, where he studied, he declined to learn Greek, which he regretted in his later years. He studied law, and as a lawyer's clerk superintending the removal of a family who had not paid their rent he first entered the Highlands. His first publication was rhymed versions of ballads by Bürger (1796). The first two volumes of *The Border Minstrelsy*, for which he had been preparing himself by gathering legends and hunting up old ballads for nearly ten years, appeared in 1802. *The Lay of the Last Minstrel*, begun as a ballad, published in 1805, made him very popular; *Marmion* followed in 1808; and in 1810 came *The Lady of the Lake.* He was now offered the place of poet-laureate, but declined in favor of Southey. His first novel, *Waverley*, was begun in 1805, but laid aside until 1814, when he wrote the last two volumes in three weeks. *Guy Mannering*, "the work of six weeks," and *The Antiquary* followed, all "by the Author of *Waverley*," as Scott's authorship was not known. They were very popular, and in wonderfully quick succession followed *Rob Roy, Old Mortality, The Heart of Midlothian, Ivanhoe* and the rest of the world-famous stories. His purchase of Abbotsford, the sums spent on its improvement and his generous hospitality and liberality, especially to poor writers, had used up his large receipts from his writings. The failure of both the firms that published his works, in one of which he had been a secret partner, placed Scott heavily in debt. His friends offered help and his creditors a compromise, but he declined both, and at 55 bravely undertook to pay off a debt of $700,000 by his pen. He wrote 14 hours a day, producing his *Life of Bonaparte*, several series of *Tales of a Grandfather* from Scottish history and *Woodstock.* At a public dinner in Edinburgh in 1826 he made himself known as the author of the *Waverley Novels;* which the public had already discovered, and he afterwards furnished notes and prefaces for a new edition. But his excessive labors brought on symptoms of paralysis, and he sailed to Italy for rest, everywhere receiving the honors due to his literary fame. His failing strength warned him of the end,

SIR WALTER SCOTT

and he begged to be taken back to his beloved Tweed. He reached Abbotsford, where he died on Sept. 21, 1832. In the last moments of consciousness he turned to the window for a last look at the Tweed, and then said: "To-night I shall know all." At his death over $500,000 of his debts had been paid, and, soon after, the copyrights of his novels brought in sufficient to pay the last dollar. His novels have been translated into almost every civilized language. He was buried at Dryburgh Abbey, and a Gothic temple was built to his memory at Edinburgh. See *Life* by Lockhart; *Journal* by himself; and *Scott*, in the English Men of Letters Series, by R. H. Hutton.

Scott, Winfield, an American general, was born at Petersburg, Va., June 13, 1786. He studied at William and Mary College,

WINFIELD SCOTT

and first became a lawyer, but in 1808 entered the army as captain. In the War of 1812 he was sent to the Canadian border, where he fought at Queenston and at Lundy's Lane, being taken prisoner at Queenston, but was soon exchanged and was wounded in both the battles, having two horses shot under him at Lundy's Lane. He was made a major-general for his services, receiving also the thanks of Congress. His services were helpful in preserving peace during the nullification troubles in South Carolina, where he commanded the Federal forces at Charleston Harbor, and also in the disputes about the border of Maine in 1839. As commander-in-chief of the United States army, which office he held from 1841, he took command of the invasion of Mexico in 1847. He captured Vera Cruz, and defeated Santa Anna at Cerro Gordo, taking Jalapa and Puebla. The battles of Contreras and Churubusco might have been followed by the taking of the capital, but an effort was made to negotiate a treaty. The castle of Chapultepec was taken by storm, and on Sept. 14, 1847, Scott's army marched into the City of Mexico, where he commanded until the treaty of peace was signed in February, 1848. He was a candidate for the presidency in 1852, but failed of election. At the beginning of the Civil War he was in charge of the army, but soon yielded his position to younger and stronger men. He died at West Point, May 29, 1866. Exceptionally competent military men rank him highly as a general. See *Life* by Mansfield and *Memoirs* by himself.

Scran'ton, Pa., a city on Lackawanna River, is 144 miles northwest of New York. It is a substantially built city and the third in size in the state. Its prosperity is largely due to its situation in the anthracite region, which gives it an immense coal-trade and a large business in mining-supplies. It has many and various industries which furnish employment for 30,000 people. There are great iron and steel factories, which produce locomotives, boilers, machinery and tools, besides many silk-mills, which give Scranton second place in the United States in this line. The large foreign population is principally engaged in mining. Much attention is given to school-work, and for this purpose there is an annual expenditure of half a million dollars. There are more than 40 public-school buildings, two high schools and one manual-training school. Scranton has ten colleges and academies, five public libraries and many beautiful churches. It has three electric lines and excellent railroad facilities, having the services of five railroads. Population 125,000.

Scream'er, a class of South American birds most nearly resembling ducks and geese. The horned screamer, found in Brazil and Guiana, is about as large as a turkey and blackish brown in color, with a long, slender horn on the head. It lives in swamps, eating the leaves and seeds of water-plants. The crested screamer has no horn, but, instead, a bunch of tall feathers. The name is given beause of its loud, harsh cry.

Screw, a simple mechanical device for transforming a motion of rotation into one of translation. An external or ordinary screw is made by cutting a spiral groove on the surface of a cylinder; an internal screw, generally called a nut, is made by cutting a similar groove on the inside surface of a cylinder. The elevation of metal adjoining this groove is called the thread of the screw. When the nut is slipped over the screw and held so that it cannot rotate, and the screw is placed in bearings so that it cannot be translated, it is evident that for every turn of the screw the nut must advance along the axis of the screw by a definite amount. The amount of this advance is called the pitch of the screw. The arrangement just mentioned forms the most accurate mechan-

ical method for measuring small distances and for producing small displacements.

Ordinary screws are generally made by forcing a steel nut, called a die, over a cylinder of metal. In like manner, nuts are made by forcing a conical screw, provided with sharp cutting-edges, through a hollow cylinder of metal. This conical screw is called a tap. Higher grades of screws are made by placing a cylinder between the centers of a lathe and then moving the cutting tool along the lathe-bed on a carriage which is itself operated by another screw.

With elaborate precautions, Professor Rowland (*q. v.*) succeeded in this way in making a more perfect screw than had ever been made before, on which, when finally corrected, moved the ruling-point of a dividing-engine with such accuracy that no single ruling was in error by as much as 1-100,000 of an inch. Woodscrews, so-called, are metal cones, upon which a thread has been cut and a slotted head made. They have pointed ends for starting into wood, where they cut their own nuts and act rather as *clamps* than *screws*. Consult SCREW, in *Encyclopædia Britannica*, by Rowland and Rankine's *Machinery and Millwork*.

Screw-Propel'ler, a wheel with two or more radial blades in the form of a helix or spiral, used to propel a vessel. In modern ocean-steamers, there generally are two propellers, one on each side of the keel. The action of the propeller is similar to that of a screw revolving in a fixed nut, the water being more or less fixed as regards the revolving propeller. The screw-propeller was suggested by Bernouille of France in 1752, and in 1801 John Stevens of Hoboken, N. J., made a successful experimental boat with a screw-propeller. But it was not until between 1835 and 1840 that it began to come into general use. Its practical use was then demonstrated by F. P. Smith in England and by Capt. John Ericsson, first in England and later in the United States. Ericsson is generally given the credit of having made the first successful application of the screw-propeller to steam-navigation. At present it is the only method of propulsion used on large steam-vessels. The design of the shape and size of the propeller depends on conditions more or less peculiar to each vessel, and requires not only calculations but often experiments before the best shape is found for a given boat. Propellers are generally made of gun-metal. The dimensions of the propellers and shafts on the transatlantic steamers are very large. For the *Celtic*, a White Star steamer of 14,259 tons displacement, the two propellers each have a diameter of 20 feet and are carried on steel shafts of 19½ inches diameter. Consult the U. S. Navy Dept.'s professional papers.

Scribe, a name used among the Jews originally to indicate a military officer, whose business was recruiting soldiers and levying taxes. Later the name was given to those who copied the books of the law, and, as those who copied the law became its best expounders, the word had in the time of Christ come to mean an expounder of the law or a learned man. Scribes were found all over Palestine, and were reverenced by the people as public teachers and lawyers. Some were members of the Sanhedrin or court, and some had public class-rooms, where their disciples sat at their feet. Those who did not fill these higher places were engaged in copying the books of the law and of the prophets and in writing contracts, letters of divorce etc. See Schürer's *History of the Jewish People in the Time of Christ*.

Scud'der, Horace Elisha, American man-of-letters, was born at Boston, Mass., Oct. 16, 1838, and graduated at Williams College. After teaching for three years in New York City, he took to writing stories for youth and edited a magazine in their interest. From 1890 to 1898 he edited *The Atlantic Monthly*, and became a resident of Cambridge, Mass. Here he assiduously pursued a literary life, writing, besides his successful series of *The Bodley Books* and a brief *History of the United States*, a monograph on *Noah Webster*, an historical biography of *Washington* and a collection of essays and criticisms entitled *Men and Letters*. He was the editor, also, of the series of volumes of the *American Commonwealths* and author, jointly with Mrs. Taylor, of the *Life of Bayard Taylor*. He was one of the writers, moreover, of Bryant and Gay's *History of the United States* and of Justin Winsor's *Memorial History of Boston*. Above all, he wrote the classic biography of James Russell Lowell. He died on Jan. 11, 1902.

Sculpture (*skŭlp'tûr*), from a Latin word meaning to cut out or carve, is the art of representing the form of an object in a solid substance. When a figure is only partly raised from a background, it is called relief and has different names according to the degree in which it is raised, as bas-relief, meaning low relief. Wood, marble, granite, bronze, gold and ivory are some of the materials used in sculpture; anything that can be cut or molded into shape being used. The Greeks and Romans worked largely in marble, especially the pure, white marble brought from Paros (*q. v.*) called Parian marble. The art is an ancient one, beginning with the use of memorial stones and the making of images of the gods. The Egyptians are among the earliest nations to use sculpture in their religion, their temples being covered with reliefs, while innumerable statues of gods stood upon their plains. The Sphinx was probably sculptured about 4,000 B. C. The specimens of Assyrian sculpture found

belong to the 9th and 8th centuries B. C. and are largely bas-reliefs, made on a large scale and of curious forms, as the colossal winged bulls, with human heads, that guarded their palaces. The first monument of classic Greek art which has come down to the present time is the marble statues on the temple of Athena at Ægina, by an unknown author. They now are at Munich. Pheidias, the greatest of Greek sculptors and of the world, known by his great work, the Parthenon, was followed by Praxiteles, Scopas and Lysippus, with such works as the *Venus of Milo, Apollo Belvedere* and *Laocoön*. The best artists of Rome were Greeks, and her treasures of art were largely brought from the plundered cities of Greece. For centuries the art of sculpture was almost lost until the 14th and 15th centuries, when Ghiberti made his wonderful gates at Florence and Donatello his statues of St. Mark and St. George, and Michael Angelo towered above all others. The 17th century witnessed only a falling back in the art of sculpture, with no immortal names among the artists; but the names of Houdon, Canova, Chantrey, Gibson, Thorwaldsen and Rude, among others, adorn the 18th century. The art had many followers in the 19th century, as Alfred Stevens of England, with his magnificent monument to the Duke of Wellington, and Barye, Rodin and many others in France, and Powers, Crawford, Greenough, Rogers, MacMonnies and St. Gaudens in the United States. See *History of Sculpture* by Lübke and *History of Greek Sculpture* by Murray.

Scutari (*skōō'tä-rē*), a town in Turkey, on the eastern shore of the Bosporus, opposite Constantinople, of which it is a suburb. It is built on the slopes of a hill, and has handsome mosques, bazars, a *dervish* college and factories of cotton, silk and leather goods. It is famed for its large cemeteries adorned with great cypress-trees, where many of the Turks from the city are buried, because it is the sacred soil of Asia. During the Crimean War the barracks and hospital of the English troops were at Scutari, and formed the scene of Florence Nightingale's labors. A marble obelisk marks the site of the English burial place. Population from 30,000 to 40,000. Scutari also is a government in Albania; area 4,170 square miles; population 294,100.

Scylla and Charybdis (*sĭl'lȧ and kȧ-rĭb' dĭs*), in Greek legend, were two sea-monsters who dwelt on opposite sides of a narrow strait. Scylla had 12 feet, six necks and six mouths, with three rows of teeth in each, and barked like a dog. Charybdis lived on a cliff under a large fig-tree, and three times a day she sucked up the waters of the sea, and three times threw them back. Ulysses passed safely between the monsters, but Scylla snatched away six of his sailors. The names are now applied to a whirlpool in the Straits of Messina near Italy. From the difficulty of passing between them without falling into one or the other rises the proverb: To shun Charybdis and fall into Scylla.

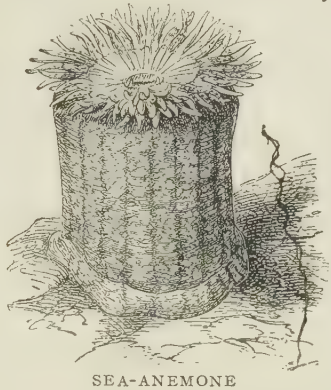
Scythians (*sĭth'ĭ-ans*), an ancient race of Asia. The name is given either to the Scythians proper, the Scolots, or to all the wandering tribes who lived on the steppes from Hungary to Turkestan. The Scythians proper were a wandering people, living in the treeless plains between the Danube and the Volga. They lived in tent-covered wagons, kept herds of horses, cattle and sheep, fought with bows and arrows on horseback, made drinking-cups of the skulls of their enemies, and worshipped (without images) gods like those of the Aryan Greeks. They seem to have learned some of the arts of civilized life from the Greek colonies, and a Scythian king went to Athens to study under Solon. In the 7th century they invaded Media, occupying it ten years, until Cyaxares made all their chiefs drunk at a banquet and slew them. The Scythians of Europe were nearly exterminated by the Sarmatians (*q. v.*) in the 4th century. The Scythians of Asia overran Parthia (northeastern Persia) about 128 B. C., and founded a kingdom in the eastern part of the empire, so that that part of Asia was called Indo-Scythia. In the century before and the century after Christ they invaded northern India, where they held possession for four or five centuries. Consult Mahaffy's *The Greek World under Roman Sway*.

Sea. The waters of the sea cover about 143,259,300 square miles or about five sevenths of the earth's surface. The ocean-basins are filled with sea-water to within about 2,250 feet of the general level of the continents, the average depth of the water in these basins being 12,480 feet. Were the solid crust of the earth to be reduced to a level, the surface of the earth would then be covered by a universal ocean with a depth of about two miles. The greatest depth recorded is 4,655 fathoms in the North Pacific, east of Japan. The bulk of water in the whole ocean is stated to be 323,800,000 cubic miles. The temperature of the surface waters varies from 28° F. in the polar regions to 85° or 86° F. in equatorial regions. The bottom waters vary from 32.7° F. to 36.8° F. At a depth of a little over half a mile the water of the tropics generally has a temperature below 40° F. The circulation of oceanic waters is kept up by the action of the prevailing winds on the surface layers. In the southern hemisphere the warm water of the tropics is driven to the south along the eastern coasts of South America, Africa and Australia, till, between 50° and 55° latitude, it sinks on being cooled, and spreads slowly over the ocean floor to the

north and south. A similar circulation takes place in the north; the cold water which occupies the deeper parts of the Arctic basin is largely made up of the dense Gulf-Stream water which sinks to the bottom on being cooled in the Norwegian sea. The water evaporated from the sea is borne to the land, and condensed on the mountain slopes. Over 6,500 cubic miles of this water are yearly sent back to the sea by rivers, carrying with it salts and earthy matters; in this way the ocean has in all probability become salt in the course of ages. The saltest waters are found where evaporation is the greatest, for example in the Red Sea, the Mediterranean and the trade-wind regions of the ocean-basins. Owing to the constant circulation in the ocean, oxygen and other gases of the air are carried down to the greatest depths; thus animals and plants may flourish throughout the whole extent of the ocean. Water is but slightly compressible, and almost any substance which will fall to the bottom of a tumbler of water will in time fall to the bottom of the ocean. Still, the pressure amounts to four or five tons per square inch; hence in an ocean with a depth of five miles, were the action of gravity suddenly to stop, the ocean-waters would rise 500 feet above their present level by expansion.

Pure sea-water is a light shade of blue; but it sometimes is a shade of green or brown, owing to foreign matter or plants and animals floating in it. Some form of life is scattered throughout the whole ocean. A trawl at a depth of over two miles brought up 200 specimens of living animals; a trawl in about three miles' depth yielded 50 specimens; and fishes and animals have been found at over four miles depth. The term *benthos* is now used for all animals and plants which live attached to, or creep over the bottom of the ocean, *plankton* being the term for all plants and animals which live in and are carried along by the currents of the ocean. Life is most abundant in the surface waters down to about 100 fathoms, is less abundant in the intermediate regions, and becomes more plentiful within a few hundred fathoms of the bottom. The shells and skeletons of animals and fishes fall to the bottom after death and make a large part of the sea-deposits in many regions, especially in the deeper parts of the ocean. Besides these pelagic deposits, there are others, mainly made up of the débris from the solid land of the globe, laid down in greater or lesser nearness to the shores of continents and islands, which are called terriginous.

Sea=Anem'one. A kind of polyp which does not secrete a coral-stock. They resemble flowers in shape and coloration, and are among the most interesting organisms to be met with on the sea-beach. They prove a great attraction in aquaria. Their essential structure is that of a fleshy cylinder attached by its base to a rock and presenting at its free extremity the mouth surrounded by a fringe of tentacles, sometimes as many as 200, by which the little animal seizes its food,—small crustaceæ and mollusks. They are practically stationary, but can move very slowly over the surface to which they attach themselves. They grow to three inches in diameter. They multiply by budding and by eggs. They are very long-lived. One taken by Sir John Dalyell in 1828 lived until 1887. They are used as food in Italy, Greece, Provence and various other coasts.



SEA-ANEMONE

Sea=Cu'cumber is a name applied colloquially to the holothurian, which is a soft and worm-like sea-polyp. All these species have a very simple bodily structure, with great power of reproducing parts that are injured or lost. They possess sensitive tentacles at the mouth. The large sea-cucumbers or sea-slugs, known as *beche-de-mer* or *trepang*, are highly prized by the Chinese for food. *Trepang* properly is the dried body of this sea-cucumber. It is gelatinous, and used in soup. Sea-cucumbers are most numerous in the warmer reigons of the Pacific.

Sea=Hare. A small mollusk, slug-like in appearance, deriving its popular name from the prominent character of its front pair of tentacles, which somewhat resemble the ears of a hare. They are widely distributed and generally inhabit muddy or sandy tracts. They feed on sea-weeds and small crustaceans. Sea-hares were notorious among the ancients for their supposed venomous properties, and were used as ingredients of poisonous potions. A chief proof of the magic-practice of Apuleius was the fact that he obtained sea-hares from fishermen. They are harmless, but some species exude an acrid liquid irritating to the human skin. They also emit a rich, purple fluid which, like the ink of the cuttlefishes, has the property of diffusing itself quickly throughout the surrounding water.

Sea=Lion. See SEAL.

Sea=Ur'chin, a very common sea-animal grouped with the *Echinoderms*. The common sea-urchin has a globular shell or *test* composed of carbonate of lime, and made of

six-sided plates nicely fitted together. The shell is covered with spines, which vary in length and size according to the variety of the animal. Five rows of the plates composing the shell are perforated by openings for the tube-feet, and five rows are without such openings. The animals move mainly by tube-feet, but the spines also are movable and aid in locomotion. The mouth, with a complicated masticating apparatus, is on the under side. They feed on seaweeds and organic matter found in the mud. Some forms are flattened and called sand-cakes. For illustration see ECHINODERMATA. See, also, SAND-DOLLAR.

Seal, a carnivorous animal fitted for a life in the water. The animal famous for

FUR-SEAL

yielding the valuable fur, called seal-skin, is not a true seal, but a kind of sea-lion with ears and more flexible limbs. The true seals have no external ears and their hind limbs are closely united together, being useless on land but very effective in water. The hind limbs of the sea-lions are separated, and are used by the animal when on land. All kinds of seals come on the land or on ice in great numbers during the breeding-season. The true seals vary from four to eight feet in length. Their fur is stiff, and they lack the woolly under fur of the fur-seals. They occur on both sides of the Atlantic. The common harbor-seal is found on British coasts and on those

GREENLAND SEAL

of Europe and North America. It is four or five feet long, usually yellowish gray, with darker spots. The Greenland seals are larger; they congregate on shore in immense numbers for breeding. All true seals are awkward on land, and move by means of the muscles of the trunk, assisted a little by the fore limbs. The hind limbs are entirely passive. A large number (390,-174 in 1892) are killed annually for their hides and oil. Seals feed mainly on fish, but also eat crustacea and mollusks. The harbor-seals are sometimes destructive to salmon. The eared-seals, sea-lions, or sea-bears vary greatly in size. The larger ones reach a length of about ten feet. Their hind limbs are flexible and they make considerable journeys inland, but return to the water for food. To this group belong the fur-seals of the northern Pacific. They are of moderate size, a full-grown male being about six feet and a female about four feet in length. These animals breed on the Pribilov, Commander and Robben Islands of the North Pacific and of Bering Sea. Since 1835 they have in a measure been protected by law. The males three years old — at which age their fur is finest — are taken for their skins, with unusually large ones two years old and small ones four years old. From 1871 to 1889, inclusive, about 100,000 animals were taken annually, but they began to show a decline in 1885, and in 1890 only 21,000 skins were secured. In 1895 and 1896 the number was reduced to 16,000 and 15,000 respectively. Controversies in reference to these seal-fisheries arose between the United States, England and Russia. The questions were referred to arbitrators who met in Paris in 1893. In 1896 the United States and Great Britain each appointed a commission to study the life of the seals and the causes for their decline in numbers. The members of the American commission reached the conclusion that the decline in the herds is due to killing females in the open sea, where the sex cannot be readily distinguished. This form of capture should be abandoned, and the hunt for skins should be confined to killing on the land and restricted to three-year-old males. See Allen's *Fur-Seal and Other Fisheries of Alaska* (Washington, 1889), and Jordan's *Report of the Fur Seal Investigations* (Washington, 1898).

Seal'ed Orders are orders which are delivered to the commanding officer of a ship or squadron, sealed and only to be opened when at sea. The commanding officer of a ship or squadron is sent to sea under sealed orders when sailing on any secret service, to prevent the destination and object of the expedition from becoming known. The commander, equally with all under him, is ignorant of where he is to sail or what he is to do until the seal is broken.

Seal'ing-Wax. Before ordinary sealing-wax was known in Europe, colored bees-wax was used for sealing letters and docu-

ments. Sealing-wax was probably first made in India or China. The best red sealing-wax is made of shellac, Venetian turpentine and vermilion to which is often added magnesia, chalk or gypsum. In parcel-wax the main ingredient is common resin.

Seasons (*sē'z'nz*). The motions of the earth on which the seasons depend are explained in EARTH. The chief cause of the greater heat of summer and the greater cold of winter is that the sun's rays fall more obliquely on the earth's surface in the latter season than in the former. Another cause is the greater length of the day in summer and of the night in winter. In the tropics the sun's rays always are so nearly direct that no one part of the year is sensibly colder than another. But the zone of calms, in which the rainfall is almost continuous, moves northward with the sun in the northern summer and southward in the southern summer. As the wet zone follows the sun, the regions it crosses have wet and dry seasons. In the arctic and antarctic regions spring and autumn are very short, the year dividing itself simply into a long winter and a short summer. In temperate regions the year is naturally divided into spring, summer, autumn and winter. The almanacs assume that spring begins at the vernal equinox, March 20; summer at the summer solstice, June 21; autumn at the autumnal equinox, Sept. 21; and winter at the winter solstice, Dec. 21. However, the greatest heat is reached sometime after the summer solstice, the time when the sun's rays are most nearly vertical and the day is longest. In like manner the greatest cold of winter comes after the winter solstice the time when the day is shortest and the sun's rays most oblique. The reason in the former case is that, as summer comes on, the earth itself becomes more heated; in the latter, that it keeps a part of the heat which it had got in summer, just as the warmest part of the day is a little after midday and the coldest part of the night is toward morning.

Seath, John, was born in Fifeshire, Scotland, in 1844. He obtained his degree in arts at Queens College, Belfast, winning prizes and a medal. He moved to Canada in 1861, and in 1862 was appointed headmaster of Brampton High School (Ontario). For ten years (1874–84) he was head-master of the Collegiate Institute at St Catherines, and in 1884 he was appointed inspector of high schools. He is the author of a grammar for senior scholars and of a school-edition of Milton, and is senator of the University of Toronto. Mr. Seath's services to the cause of education in Ontario can scarcely be adequately valued. Especially in the cause of secondary education has he been privileged to do lasting good. He now holds the position of superintendent of education for the province.

Seat'tle, Wash., a port of entry and largest city of the state, is the county-seat of King County. Rising from the shores of Elliott Bay on the west, the city covers numerous hills, embraces Lake Union and Green Lake within its borders, and reaches on the east to Lake Washington, a beautiful body of fresh water 22 miles long and from one to three wide. The business district is substantially built in the manner of a progressive, modern city; the hills are covered with handsome homes and attractive cottages; the parks and boulevards are being made into a system of rare beauty and extent; and the scenery afforded by the combination of lakes, sound and mountains is striking and beautiful. Public buildings, prominent among which are the library and the new Federal building; schools and educational institutions, as the high schools and the University of Washington; houses of worship, with the Roman Catholic cathedral and the new First Presbyterian church as conspicuous edifices; and good hotels, theaters and club-houses are numerous. The school-system is excellent, the buildings fine, and textbooks are furnished free. Higher educational institutions consist of the University of Washington; the College of the Immaculate Conception (R. C.); Holy Name Academy (R. C.); and Seattle Seminary (M. E.). Transportation facilities, position as a distributing point both for domestic and for foreign markets, supply of fuel and cheap power and raw material for various lines of industry are causing Seattle rapidly to become a manufacturing center. Among the chief industries are ship-yards, flour and rolling mills, shingle and lumber mills, foundries, iron-works, fishcanning and woodworking.

Piers for handling ocean and land traffic line the front of Elliott Bay. The commerce of the port has advanced with astonishing rapidity, and it is expected that it will advance still more when the project to connect Lakes Washington and Union with Puget Sound by means of a canal capable of floating the largest ships is accomplished. King County is planning to raise an additional million dollars by levying a tax on a specially created assessment district, authorized by the Legislature at its last session. The canal, which will give Seattle a fresh-water harbor unexcelled, will be built in accordance with plans made by the national government. The bulk of the Alaskan trade passes through Seattle. Several lines of steamships, including the largest freight-carrier in the world, ply regularly between Seattle and the Orient and other parts of the world, particularly to the countries bordering on the Pacific. The Northern Pacific and Great Northern railways have vast terminal facilities, while the Union Pacific and Chicago, Milwaukee

and St. Paul, which have acquired holdings almost equally large, are building to Seattle as rapidly as possible; the Burlington and the Canadian Pacific now reach the city by traffic arrangements with existing lines.

The water-plant is owned by the city, and water is supplied by Cedar River and Cedar Lake. From the fall of Cedar River power is obtained to operate the lighting-plant, which is also owned by the municipality. Seattle has a fine street-car system and all modern improvements. Extensive preparations are under way for the Alaska-Yukon-Pacific Exposition, to be opened on June 1, 1909. Seattle was settled in 1852, laid out in 1853, and named in honor of a noted Indian chief. It incorporated in 1865 and re-incorporated in 1869. In 1880 it had a population of 3,533; in 1908 this had become 252,000.

Sea'weeds. See ALGÆ.

Sebastian (*sê-băs'chan*), **St.,** a martyr of the early church, was a native of Narbonne. Under Diocletian he became a captain of the prætorian guard and secretly a Christian. It came to the ears of Diocletian that Sebastian encouraged those who were being led out to death for being Christians; so the emperor had his captain tied to a stake and shot by archers. But they did not wholly kill him; a pious woman named Irene took him away and tended his wounds. As soon as he recovered, Sebastian boldly faced the tyrant and upbraided him for his cruelty. Diocletian then ordered him to be beaten to death with rods (about 288 A. D.). His first martyrdom — a young and handsome soldier bristling with arrows — was a favorite subject for the Italian religious painters, as Mantegna, Veronese and Domenichino.

Sebastopol (*sê-băs'tô-pŏl'*), a Russian seaport and fortress, is near the southwestern end of the Crimea, on the southern side of one of the finest harbors in the world. The place is celebrated for its long siege by the French, Turks and English in the Crimean War of 1854-5. The town and harbor were defended by forts of immense strength, built of limestone faced with granite, on which artillery made little impression. On the land-side the earthworks and fortifications raised by General Todleben kept the armies of France and England at bay for 11 months. But the capture of the Malakoff and Redan works at length forced the Russians to evacuate the lines. The town was mined and the docks and forts blown up by the allies. The fortifications and docks have since been rebuilt. The imports are mainly cotton and coal; the exports, grain. The town was founded in 1783 under orders of Empress Catharine II. Population 53,595, including a garrison of 12,000. See Leo Tolstoi's *Sebastopol.*

Secord, Laura, a heroine of the war of 1812. On June 23, 1813, Col. Boerstler, U. S. A., with 550 men and two cannon, advanced upon the little outpost at Beaver Dam near old Fort George. News was borne to the garrison under Lieut. Fitzgibbons by Laura Secord, whose husband lay wounded in Queenston. She set out at dawn, driving a cow by way of pretext to pass the American sentry, ran and walked through the wildest of woods for 20 miles, and late in the day arrived with her intelligence. As a result 200 Indians succeeded in ambushing Boerstler's command, which surrendered, laying down their arms to a British lieutenant with 260 Indians, militiamen and regulars.

Sec'retary-Bird, a large bird of South Africa, receiving its name from the arrangement of a number of black and gray quills over the ear, in the position of a clerk's pen. It belongs with the birds of prey, but on account of its long legs, has been classed with the wading birds. From its eating snakes it has also received the name of the serpent-eater. The bird is about four

SECRETARY-BIRD

feet long from bill to tip of tail, which is about two feet long. The legs and neck are both long, and the body makes up only a small part of the bird. The general color of the plumage is clear gray. They are shy in their native haunts, but have been domesticated by Cape Colony farmers. Their

favorite food seems to be frogs and toads, but lizards and many snakes are devoured. The nest is built high up in a tree, and two or three, large, white eggs are deposited. On the ground the bird walks with a stiff military gait, but can run with great swiftness.

Secre'tion (in plants), in its broadest sense, the process by which substances are separated from the protoplasm; also the substances so separated. In this sense the cell-wall and starch-grains are secretions, since they are formed by the protoplasm and separated from it. The term is usually applied, however, to waste products (sometimes distinguished as excretions) or to products which have some special function, *e. g.*, enzymes (*q. v.*) and nectar. The number and variety of secretions are very great. Some are formed in a special cell or group of cells, constituting a gland, which may be on the surface (*e. g.*, in geranium leaves) or may adjoin an internal space into which the secretion is poured (*e. g.*, resin-glands of pines). In other cases the secretion accumulates in the gland-cells, which finally die, leaving a mass of the secretion occupying their room, *e. g.*, in orange-rind. The methods by which the secretion is put forth from a cell are not known.

Seda'lia, Mo., a thrifty city, is situated in a fine farming district and is a nest of factories. There are car-works, machine-shops, woolen-mills, manufactories of agricultural implements, wagons and furniture. It has fine railroad facilities, several roads converging here. It was founded in 1860, has five colleges and excellent public schools, and is especially an educational city. Population 20,000.

Sedan (*sĕ-dăn'*), a town and frontier fortress of France, stands on the Meuse, 64 miles northeast of Rheims. The citadel surrendered to the Germans in 1815; but Sedan is chiefly noted for the surrender, Sept. 2, 1870, of Napoleon III and 86,000 men to the Germans in the Franco-Prussian War. The Germans, under the command of King William of Prussia, began the battle on September 1. By manœuvers and hard fighting the French under Marshal MacMahon were driven from all sides to the fortress, where, defeated, surrounded and without provisions, they were forced to surrender. The emperor was sent a prisoner to Wilhelmshöhe, and two days later Gambetta proclaimed the republic at Paris. Colbert founded at Sedan cloth-mills, which now employ 10,000 men. Sedan-chairs were named from this town, where they are said to have been invented. Population 19,350.

Sed'don, Richard John, premier and treasurer of New Zealand and minister of labor, defence, education and immigration, was born at Eccleston, Lancashire, England, in 1845, and educated there. He went to New Zealand in 1867. A mechanical engineer by profession, he had an intimate acquaintance with workingmen and their needs, and was continuously in public service after entering its house of representatives in 1879. His death occurred on June 10, 1906.

Sedge, the name of a family of plants, one class of which contains over 200 kinds in North America. They are mostly found in swamps and other wet places, forming often thick tufts. The stems are solid and triangular. Sedges are most common in cold countries. They differ in some important respects from grasses, especially in being worthless as pasture or food plants.

Sedg'wick, Catherine Maria, American novelist and writer, was born at Stockbridge, Mass., Dec. 28, 1789, and died near Roxbury, Mass., July 31, 1867. She was the daughter of Theodore Sedgwick (1747-1813), the Federalist politician and jurist. She herself is noted as one of the earliest of American women of letters, a contributor to the *Annuals* in vogue early in the literary history of the United States, and a voluminous and entertaining writer of moral tales and miscellanies. Her chief works embrace *A New England Tale; Redwood,* reprinted in England and appearing in three or four European translations; *Hope Leslie;* and *Linwoods.*

Sedgwick, John, was born at Cornwall, Conn., Sept. 13, 1813. A West Point graduate, he served in Florida as second-lieutenant when the Cherokees were removed. He also served through the Mexican War, gaining promotion at Contreras, Churubusco and Chapultepec. His record in the Civil War was brilliant. By the spring of 1862 Sedgwick was in command of a division, and in July of that year was made major-general of volunteers. As commander of the 6th or Sedgwick's corps, as it was called, he made a forced march of 35 miles to Gettysburg, and there commanded the left wing in the battle. Three days after the battle of the Wilderness, May 5 and 6, 1864, in which he had taken part, he was shot by a sharpshooter while ordering a battery to be brought into position. See MacMahon's *Address on Major-General Sedgwick.*

Seebeck (*zā'bĕk*), **Thomas Johann,** a German physicist, born April 9, 1770, at Reval, died on Dec. 10, 1831, at Berlin. Seebeck will be remembered principally for his very important discovery of thermo-electric currents, sometimes called the Seebeck effect. This is the converse of the Peltier effect. (See ELECTRICITY.) For an excellent account of these two "effects" see J. J. Thompson's *Elements of Electricity and Magnetism,* ch. 14.

Seed-Disper'sal is the scattering of plant reproductive bodies, especially seeds and the seed-vessels (see FRUITS) containing them, by wind, water, animals and other agencies. The benefit to the plant is in

getting away from the parent plant and getting a foothold in soil not already exhausted of those elements needed by that particular species. These bodies may be carried by the wind by being light or by having sail-like or feathery appendages on the seed, as the milkweed and catalpa, or on the seed-vessel, as the maple and dandelion. Spines or hooks, usually a part of the seed-vessel, fasten to birds or other passing animals, as is done by the burdock and stick-tights. Indigestible seeds of edible fruits are carried by birds. Seeds are carried by mud clinging to the feet of water-birds. For other methods of spreading than by seeds, usually considered in this connection, see PROPAGATION. Consult Beal's *Seed-Dispersal.*

Seed-Plants. The common name of Spermatophytes (*q. v.*).

Seeds. In general a seed is a transformed ovule, and an ovule is an megasporangium (*q. v.*). The transformation is connected with the process of fertilization. The most apparent effect is the development of the hard coat or *testa*, which has to do with the protection of the delicate structures within. This *testa* is usually formed in connection with the integument of the ovule. Within the seed-coat the essential thing is the embryo (*q. v.*). Around the embryo may be deposited more or less endosperm (*q. v.*), and outside of the endosperm, in some seeds, is the perisperm (*q.v.*). A seed is well-devised for carrying a plant through an unfavorable season of drought or cold. The length of time a seed may retain its vitality and be made to germinate is known only in the most general way. The old story of the germination of wheat derived from mummies in Egypt was contradicted almost as soon as it was started, but the contradiction has never yet overtaken the original statement. That seeds may endure for several, often for many, years and then be made to germinate is well-attested, but the data are very uncertain. Seeds must be carried out of reach of rivalry with the parent-plant and with each other. Various agencies have been used to effect this dispersal: (1) *Currents of air.* The wind transports numerous seeds, which have been prepared for this agency in a variety of ways. Some have tufts of hair, others plumes, others wings. Often it is the fruit rather than the seed which bears the tuft of hairs (as thistle) or the wings (as maple), but the result is the same. (2) *Currents of water.* Many seeds may be carried long distances by water and still be able to germinate. The banks and flood-plains of streams constantly receive seeds from the regions toward the headwaters, and the more extensive the area drained by a stream the more varied is the collection of seeds on its flood-plain. The oceanic currents probably carry seeds the greatest distances, transporting them from continents to islands, even from continent to continent. By experiment Darwin found that numerous seeds could be soaked in sea-water long enough to be carried over 1,000 miles by an oceanic current without losing the power of germination. (3) *Animals.* Many seeds and fruits develop grappling appendages of various kinds, by means of which they adhere to animals brushing past, as the tickseed, Spanish needle etc. Migrating birds, especially those which visit marshy shores, are great carriers of seeds which are imbedded in the mud adhering to their feet. Fruit-eating birds also transport seeds, which may pass through the alimentary tract without losing the power of germination. (4) *Explosive fruits.* In some cases fruits have the power of forcibly discharging their seeds, as the violet, witch-hazel, touch-me-not etc. This method is interesting, but not so effective as the others, since the distance traversed is necessarily very limited.

JOHN M. COULTER.

Seeley (*sē'lĭ*), **John Robert,** an English historian born in 1834, who died in 1895, was the author of notable books, historical and religious He held a professorship at University College, London, and in 1869 was appointed professor of modern history at the University of Cambridge. His writings embrace a *Short History of Napoleon I, Lectures and Essays, Life and Times of Stein, The Expansion of England, Natural Religion* and *Ecce Homo.* This, his most celebrated book, studied the life and character of Jesus as a human being.

Seidl (*zīd'dl*), **Anton H.,** an Austrian musical conductor, was born at Buda-Pest, Hungary, May 7, 1850, and died at New York, March 28, 1898. After studying at Leipsic under Richter and at Baireuth under Wagner, he became conductor of Leipsic Opera-House, and in 1882 made a tour of Europe as conductor of Neumann's Nibelungen troupe. In 1883 he was appointed conductor of the opera-house at Bremen, and two years later came to the United States, where he was received with favor in New York and other cities, as leader of German operas and as successor to Theodore Thomas in conducting the concerts of the New York Philharmonic Society. He was the notable exponent, for many years, in this country, of Wagner's music.

Seine (*sān*), one of the four chief rivers of France, rises northwest of Dijon and flows northwestward, with many windings, past Fontainebleau, Melun, Paris, St Denis, St. Germain and Rouen for 482 miles, falling into the English Channel at an inlet where stand the ports of Harfleur and Havre. It is navigable 350 miles from its mouth, or to Marcilly, and the improvement of the upper Seine as a canal is one of the schemes proposed to join Paris to the Atlantic. Its

main branches are the Aube, Marne, Oise, Yonne, Loing, Essonne and Eure; and canals join it to the Somme, Scheldt, Meuse, Rhine, Sâone and Loire. Deep dredging from Rouen, through the inlet at its mouth, has made that city a seaport and has reclaimed 28,000 acres of land. The situation of Paris on the Seine has made this, like the Hudson and the Thames, one of the famous rivers of the world. See Vernon-Harcourt's *The Seine*.

Seismol'ogy. That branch of physical science which is concerned with the investigation of earthquakes,— their causes and effects, their distribution and the various circumstances attending their occurrences. Professor John Milne suggests that, in addition to what are generally known as earthquakes, seismology should investigate earth-tremors which escape attention by the smallness of their amplitude; earth-pulsations overlooked on account of the length of their period; and earth-oscillations or slow and quiet changes in the relative level of the sea and land, which geologists speak of as elevation and subsidence. But seismology is a very new science, having been developed almost wholly during the nineteenth century and being regarded as yet in the early stages of its development. Its pursuit is regarded, however, as of the utmost importance to geological and other forms of terrestrial research. It already has a great and growing body of material and literature. It is hoped that soon practical applications of the science will be developed; one of these, it is confidently predicted, will be the warning to dwellers in unstable regions when earthquakes or similar disturbances impend. Milne is sanguine that earthquake warnings will be as common and as trustworthy as the storm warnings at our seaports. The value of such warnings is beyond estimate. In Japan, where earthquakes are frequent, an earthquake-investigation committee was formed in 1892 and has been investigating the practical aspects of seismology very carefully. Professor Gerland, director of the imperial German chief station for earthquake investigation at Strassburg, now issues an annual catalogue of earthquakes, and in 1903 organized The International Seismological Association. The interest is growing in America, and the broad extent of our outlying territory gives us fine advantages in collecting data. These earth-movements are recorded by seismographs, instruments found in many modern observatories. They are, essentially, a pillar extending well into the earth to gather the vibrations, with an additional device for recording them. There is wide variation in detail of construction; but the instrument traces a continuous curve, the variations of which indicate the intensity, distance, time, and duration of the shock. Professor Milne's instrument on the Isle of Wight detects disturbances in Japan, Borneo or South America.

Seis'mograph. See SEISMOLOGY.

Seismometer (*sīs-mŏm'ĕ-tĕr*), an instrument which is used to measure the amount and direction of displacement at any point on the earth's surface during an earthquake. The name is also applied to those devices by which the slow and gradual tilting of the earth's surface is indicated.

For the first of these two purposes the one thing essential is to place a body in neutral equilibrium and without friction. To realize these two conditions perfectly is of course impossible. But they can be very nearly approximated. Thus an open gate, with a heavy mass at its outer end, rotating about a strictly vertical axis with very minute friction, would fairly represent a seismometer. Three instruments of this kind, one free to move east-and-west, one free to move north-and-south and one free to move in a vertical direction, will give the three components of any motion produced by an earthquake; and by compounding these three motions we can obtain the original motion. In the modern instruments, as perfected by Prof. John Milne, these records are automatically photographed.

Seismometers which are employed to measure the tilting of the earth's crust generally use a beam of light which has been reflected, part of it from a mirror rigidly attached to the earth, and part of it from a surface of mercury, which remains horizontal whether the earth's crust is tilted or not. The variation in angle between these two beams measures the tilting of the earth. See Milne's *Earthquakes* in the International Scientific Series and Geo. H. Darwin's *Tides*, popular lectures before Lowell Institute, Boston, Mass., in which earth-tiltings are treated.

Seja'nus. See TIBERIUS.

Selaginella (*sĕl'ă-jĭ-nĕl'lă*), the genus of plants to which the "little club-mosses" belong. See LYCOPODIALES.

Selenium (*sĕ-lē'nĭ-ŭm*) is a very rare element which exists in two forms. In the glassy form at ordinary temperatures it is a solid of a dark-brown color and a non-conductor of electricity. When it is slowly cooled from its melted condition, it does not appear vitreous or glassy, but crystalline, of a dull leaden color, and at ordinary temperatures is a conductor of electricity. It is very sensitive to light, and its electrical resistance is much less in the light than in the dark. This property led to the discovery of the photophone in 1880. Selenium is found chiefly in combination with lead, silver, copper or iron; but it has also been found in sulphur and certain iron sulphides. Selenium was discovered in 1817 by Berzelius in the waste of a sulphuric-acid factory.

Seleucia (*sĕ-lū'shĭ-ă*), the name of several early cities.

Seleucia-on-the-Tigris was built by Seleucus Nicator, 40 miles northeast of Babylon, as the successor of that capital, which was despoiled to furnish it with building material. It grew fast, and at one time had a population of 600,000. It was partly burned by Trajan and razed to the ground by Avidius Cassius in 162 A. D. in the reign of Marcus Aurelius and Lucius Verus.

Seleucia Pieria (*pī-ē'ri-ă*), founded by Seleucus Nicator, near the mouth of the Orontes in Syria, was the seaport of Antioch. It was a city of importance during the wars between the Seleucidæ and the Ptolemies for the possession of Syria. A remarkable tunnel, 1,088 yards long, dug out of the solid rock, the only connection between the city and the sea, and the ruins of its threefold line of walls, fortress, temple and amphitheater speak of its former splendor.

Seleucidæ (*sē-lū'sĭ-dē*), the royal house to whom fell Syria, a large part of Asia Minor and Persia, Bactria and other eastern provinces of Alexander the Great. Seleucus Nicator was driven to Egypt by Antigonus. The date of his return to Babylon, 312 B. C., was the beginning of the Seleucian empire. Susiana, Media and the provinces as far as the Oxus and the Indus fell into his hands. Joining the confederacy headed by Ptolemy, he gained Syria, and later all Asia Minor fell to his share on the defeat of Antigonus by the allies. Planting Greek colonies and founding many cities — some of which, as Seleucia-on-the-Tigris and Antioch, became among the largest and richest in the world — were some of his plans to create a great empire. Seleucus was murdered by one of his officers in 280 B. C. Antiochus II allowed the great Parthian kingdom to rise in the east. The two ablest successors of Seleucus I were Antiochus III, the first great eastern king to come into collision with the Romans, and Antiochus IV, whose cruelties would have perhaps succeeded in supplanting the Jewish religion by the Greek worship, had it not been for the patriotic resistance of the Maccabees (*q. v.*). Antiochus died a raving lunatic. In derision his subjects changed his surname of Epiphanes or the Illustrious into Epimanes or the Madman. Syria, the last Seleucian possession, was conquered by Ptolemy in 65 B. C.

Self-Activ'ity. In the process of education there seem to be two principal factors. On the one hand are the instincts, impulses and interests of the individual, whether child or adult; and on the other hand are certain sensations and stimuli which operate from without. The name of *self-activity* is given to the native tendencies of the individual. These include instincts, impulses and interests. Every instinct, indeed, involves an impulse and tends to create an interest. The factor of self-activity in the process of education has been chiefly emphasized by the school of Froebel. By Froebel self-activity was regarded as the divinely set spark of the fire of life or the seed of all development. It was regarded as a datum of unity in the soul. However, it is a question whether one should speak of self-activity or only of *self-activities*. An analysis of self-activity would seem to involve something like the classification of instincts by Professor James in *Principles of Psychology*. Self-activity would then involve not only the natural physical tendencies but the inclinations towards imitation, emulation, pugnacity, sympathy, hunting, fear, acquisitiveness, constructiveness, play, curiosity, sociability, shyness, secretiveness, cleanliness, shame and love. It seems absurd to regard these self-activities as reducible to a single type and equally absurd to regard them as wholly independent of one another. It follows that original self-activity is neither a mere unity nor a mere set of different activities, but rather a germ both of unity and of difference. This is important for the theory of the will. The will is partly given and partly achieved. The will, indeed, simply is the unity of self-activity. Self-activity, therefore, is encouraged in education as the basis of will, effort and interest. It seems to be best developed by its own exercise. Such occupations as manual training, which involve doing rather than imitating, are therefore regarded as concessions to the doctrine of education by self-activity. Education by self-activity practically is education by development. The nature of the child is followed and not constrained. Yet it is clear that the child has to meet certain social demands. These demands are represented by the curriculum, which must be mastered. The curriculum itself can only to a limited extent cater to self-activity. It is method, therefore, rather than curriculum, which is founded upon a study of self-activity or upon child-study. Education according to self-activity emphasizes child-nature, individuality, psychological method and the principles of heredity. In general, the treatment of self-activities in education should be sympathetic but not servile. The teacher is not to eliminate them, as if they represented original sin; but he is not to pander to them where duty demands a sacrifice. They are not to be destroyed, nor yet followed; they are to be guided and controlled according to the social conception of the good.

Self-Pollina'tion (in plants), the transfer of pollen from a stamen to the stigma of the same flower. It is the same as close-pollination. See Pollination.

Se'lim I, sultan of Turkey, was born in 1467, dethroned his father, Bajazet II, by the aid of the janizaries in 1512, and put his father, brothers and nephews to death. In 1514, after massacring 40,000 Shiites, he declared war against Persia and defeated Shah Ismail near Tabriz. Three years later

he wrested Egypt from the Mamelukes and annexed Syria. He also forced the caliph of Cairo to yield the headship of the Mohammedan world and the standard of the prophet. The sacred cities of Mecca and Medina, also fell into his hands. This able yet savage ruler, however, improved the condition of the people he had conquered, kept the janizaries in order, and was a lover of literature. He died in 1520.

Seljuks (*sĕl-jūks'*), a division of the Ghuzz confederacy of Turkish tribes. Togrul Beg, grandson of Seljuk, founder of the dynasty, crippled the empire of Ghazni (1040), conquered Persia and, ten years later, Baghdad. Togrul's nephew and successor, Alp-Arslan, wrested Syria and Palestine from the caliph of Egypt, and in 1071 captured Diogenes, the Byzantine emperor. Diogenes' ransom was the best part of Asia Minor. The empire at the close of this reign (1092) began to break up into smaller kingdoms. Even before this, strong chieftains like Saladin had been really independent. In the 13th century the orders of *dervishes* arose, and the Mongols began to gain the power which they wielded over this part of Asia till the rise of the Ottoman princes, who, like the Seljuks, were Turks and had been driven westward by the Mongols. Out of their supremacy grew the Turkish empire (*q. v.*).

Sel'kirk, Alexander. See JUAN FERNANDEZ.

Selkirk Mountains, an outlying range of the Rocky Mountains, in British Columbia, reaching southward almost to the United States boundary. The range contains enormous glaciers, and is the home of bears, big-horned sheep and Rocky Mountain sheep. See W. S. Green's *Among the Selkirk Glaciers*.

Sel'ma, Ala., city and county-seat of Dallas County, on Alabama River, 50 miles from Montgomery. The city is in a cotton-growing section, and has an extensive trade in cotton, coal, lumber and iron-products. It has cotton-factories, a cotton-warehouse, cottonseed-oil mill, car-wheel shops, iron-works and railroad machine shops. Selma has public and parochial schools, Dallas Academy, Selma University (Baptist), opened in 1878, for colored pupils, private business schools, the Y. M. C. A. library and reading-rooms. During the Civil War the city had a Confederate navy-yard, arsenal, powder-works and artillery-foundries. It was captured by the Union forces on April 2, 1865. Selma has the service of four railroads, and is at the head of steamboat navigation on the Alabama. Population 12,047.

Selous', Frederick Courteney, African explorer and hunter, was born in London, Dec. 31, 1851, and educated at Rugby and in Switzerland and Germany. He left England for South Africa in July, 1871, went to Matabeleland the year after, and supported himself for 19 years by elephant-hunting and collecting natural history specimens. In 1890 he guided the pioneer expedition to Mashonaland, and in 1892 took part in the first Matabele war. He has been awarded the Cuthbert Peek grant, the Back premium and the Founder's gold medal by the Royal Geographical Society, and is a corresponding member of the Zoölogical Society. His published works include *A Hunter's Wanderings in Africa*, *Travel and Adventure in Southeast Africa*, *Sunshine and Storm in Rhodesia* and *Sport and Travel*. He lives at Worplesdon, Surrey, England

Selwyn (*sĕl'wĭn*), **Alfred Richard Cecil,** was born in Kilmington, Somerset, July 28, 1824, and educated partly in Switzerland. His pursuit of his favorite science began officially in 1845 when he was appointed assistant-geologist on the geological survey of Great Britain, a post he resigned in 1852 to accept that of director of the geological survey of Victoria. In 1869 he came to Canada as director of the Canadian geological survey, a post he held until 1895. He wrote the Canadian part of Stanford's *Compendium of Geography*, and was the editor of and an important contributor to the annual reports of the survey of Canada from 1869 to 1894. He died in 1904.

Sem'aphore. This is an apparatus for visible telegraphy by means of flags, lanterns or similar signals It is employed in connection with the block-system (*q. v.*) on railroads and at sea by means of flags. Different combinations of the flags, lanterns or movements of signal-arms may serve to indicate the different letters of the alphabet. Sometimes they are used to indicate numbers. Semaphores are of importance not only to indicate the movements of trains and shipping; but in war-signaling, when special codes are employed.

Sembrich (*zĕm'brĭk*), **Marcella.** (Real name, Praxede Marcelline Kochanska). An Austro-Polish opera-singer, born at Lemberg in Galicia, Feb. 15, 1858. She first studied violin and piano, her master on the latter being Franz Liszt. When her remarkable voice was discovered, she went to Milan to study with Lamperti. She made her début in opera at Athens in *I Puritani* in 1877. Soon she became attached to the company of the Royal Opera-House, Dresden, remaining till 1880. That year she first appeared in London. She became a great favorite in the characters of Terlina, Susanna, Constance,

MARCELLA SEMBRICH

Martha and Lucia. She came to the United States in 1883, and has appeared here in several seasons of concerts and opera. In 1903–04 she was a leading soprano at the Metropolitan Opera-House, New York, where she again appeared in 1906–7.

Semele (*sĕm'ê-lē*), in Greek story, was beloved by Zeus, and Hera, moved by jealousy, persuaded her to ask him to appear in all his majesty as king of gods and men. Having sworn to grant her every request and warned her in vain not to press her wish, he unwillingly yielded and appeared as the god of the thunderbolt. Semele was consumed by the lightning, but the child to which she was about to give birth was saved by Zeus. This child was Dionysus, the god of wine.

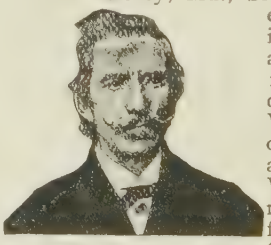
Seminoles (*sĕm'ĭ-nōlz*), at first a wandering branch of Creek Indians. In 1817 they joined the Creeks and some refugee negroes in ravaging the white settlements in Georgia, plundering the plantations and carrying off slaves whom they refused to surrender. Andrew Jackson was sent to punish them, and his expedition hastened the cession of Florida to the United States (1819). The Seminoles, numbering 4,000 in 1823, by a treaty made in that year sold most of their lands for a yearly sum. In 1832 a treaty for the removal of the whole tribe west of the Mississippi was signed by the chiefs, but the tribe, under the leadership of Osceola, would not ratify it. This led to a war, lasting seven years and costing hundreds of lives and millions of dollars. At length the tribe was removed to Indian Territory (now Oklahoma), where are now settled all the Seminoles, some 3,000, except about 200 still lingering in Florida and a few in Texas. The Seminoles are steady, sober and industrious, and in the progress they have made rank next to the Cherokees, Creeks and Choctaws. They receive $25,000 a year, besides money to keep up their schools and government. They cultivate about 8,000 acres. They have eight churches, and are under the training of Presbyterian missionaries.

Semiramis (*sĕ-mĭr'ă-mĭs*), wife of Ninus, who, according to the Greek historians, founded Nineveh. A daughter of Derceto, the fish-goddess, she was exposed to death when a baby, but miraculously fed by doves and brought up by a shepherd. Onnes, one of the king's generals, charmed by her beauty, married her; but she won the heart of the king himself by her heroic capture of Bactra, whereupon her husband had the loyalty to take his own life. Ninus soon died, leaving Semiramis to reign gloriously for 42 years, conquering in Persia, Libya and Æthiopia, but failing in her attack on India, where her army was cut to pieces by elephants. She at last disappeared, according to some stories, in the form of a dove. The name of the mighty queen survived in the names of many great works, as the hanging-gardens of Babylon, which were attributed to her. The Semiramis of the North was the name aptly given to Catherine II of Russia.

Semites (*sĕm'ītes*), a name applied to a group of nations, much alike in language, religion, manners and looks, who are represented in *Genesis x* as descended from Shem, a son of Noah. Their home is Abyssinia, Arabia, Palestine, Phœnicia, Syria and the countries of the Euphrates and Tigris. It is generally believed that as early as 4000 B. C. the Semites migrated as wandering tribes, probably from Arabia, into Mesopotamia. There they found a people dwelling in cities built of brick, under a regular government of priest-kings, skilled in metals and using cuneiform (*q. v.*) writing. Accad, Shumir and Elam were conquered, the Semites forming the upper classes of society and ruling the Akkadians and Sumerians. Chedorlaomer, a king of Elam, about 2200 B. C. conquered as far as Palestine. Some Semites migrated northwestward and founded Tyre, Sidon and other cities on the Mediterranean, and became known as Canaanites and Phœnicians. Later, others came from Ur and founded the nation of Israelites. Still others built cities which grew into the Assyrian empire.

The Semites as a race have finely-developed bodies, quick and clever minds, but are not inclined to change. Almost their only arts are the sculpture of Assyria and the glass, pottery, cloth and embroidery of the Phœnicians. They have made their mark on the world in the Phœnician commerce and colonies; in the Carthaginian empire and the exploits of Hannibal; in the spreading of the Phœnician alphabet, which is the mother of the European and most Asiatic alphabets, though it is not the oldest alphabet; in the Babylonian and Assyrian empires; in the Hebrew Bible and Jewish religion; in the New Testament and Christian religion; in the Koran and Mohammedan religion; in the Mohammedan conquests and empire; and in the preservation of learning through the dark and middle ages.

Semmes (*sĕmz*), **Raphael,** was born in Charles County, Md., Sept. 27, 1809. He entered the navy in 1826, and became a commander in 1855. He served during the Mexican War as a naval officer and also as an aide to General Worth. As commander of the Confederate steamer *Sumter*, he ran the blockade at the mouth of the Mississippi at the beginning of the Civil War. After capturing several



RAPHAEL SEMMES

merchant-vessels in the Gulf of Mexico, he sailed to England. On leaving Southampton he was pursued by the Federal steamer *Tuscarora*, blockaded at Tangier, and forced to sell his ship. In August, 1862, he took command of the famous *Alabama*, built in England and manned by an English crew. He then commenced a successful cruise against merchant-vessels. He also sank the gunboat *Hatteras* off Galveston; but on June 19, 1864, the *Alabama* was herself sunk by the *Kearsarge* in a sea-fight off the harbor of Cherbourg, France. Semmes, however, escaped in an English yacht. He opened a law-office at Mobile after the war closed, but was arrested and suffered a four months' imprisonment. He afterwards wrote and lectured on his adventures during the war. Semmes died at Mobile, Ala., Aug. 30, 1877.

Sempach (*zĕm'päk*), **Battle of.** See WINKELRIED, ARNOLD VON.

Seneca (*sĕn'ê-kă*), whose father was a prominent writer, was a Spaniard, born at Corduba (Cordoya) about 4 B. C. He studied law at Rome, where he narrowly escaped being put to death by Emperor Caligula. Later in life he entered the Roman court, but in 41 A. D. lost the favor of Claudius and suffered eight years' banishment to Corsica. After his return he became tutor to Nero, over whom he had a strong and good influence, and was made consul in 57 A. D. by his pupil, who was now emperor. As Nero (*q. v.*) rapidly sank into crime, Seneca's high moral character aroused hatred, while the teacher's wealth, heaped on him by Nero, is said to have made the emperor jealous. Nero tried to poison him, but, failing in this, had him drawn into the Pisonian conspiracy, for which he was tried and condemned. Left free to choose his own death, he opened his veins and bled to death, 65 A. D. Seneca was a noble and upright man, yet had many enemies. *On Foresight*, *On Shortness of Life* and *Epistles to Lucilius* are some of his writings, besides epigrams and eight tragedies, which show great mastery of style but are unfitted for the stage. For a striking portrait of Seneca see Hugh Westbury's *Acté*. Consult, also, Farrar's *Seekers after God* and the *Quo Vadis?* of Sienkiewicz.

Seneca Falls, N. Y., a village in Seneca County, on Seneca River, the Seneca and Cayuga Canal and the N. Y. Central and Lehigh Valley railways, about 40 miles west of Syracuse. It lies in a notable agricultural region, and was early settled; it also has extensive manufactories, which in large measure utilize the waterpower of the river. Among these are pump, fire-engine, automobile, button and machine-tool works. It is the seat of Johnson Home for Indigent Females, Mynderse Academy and Library and Rumsey Hall, a preparatory school; while in the vicinity it has a fine summer-resort in Cayuga Lake Park. Population about 7,000.

Seneca Lake, one of a range of narrow lakes in the western part of New York. It is 36 miles long, and averages two miles in width and 530 feet in depth. Steamboats ply daily from end to end. It flows into Lake Ontario through Seneca and Oswego Rivers, and is joined by canal to Erie Canal.

Senecas, one of the Indian tribes. See IROQUOIS.

Sénégal (*sĕn'ê-gal'*) is a French colony on the western coast of Africa between Gambia River and the Sahara. It extends 900 miles inland, covers 80,000 square miles and has 1,200,000 inhabitants. The colony is under civil administration, and comprises the communes of St. Louis, the capital; Dakar, a fortified naval station that is the seat of the general government of French West Africa; Rufisque; and Gorée. These are directly under the governor, and the inhabitants, numbering 107,826, are French citizens and elect a deputy to the Parliament at Paris. The colony also includes nine circles under other administrators, where the natives are not citizens of France, and other districts that govern themselves under French protectorates. Everything outside of the territories mentioned is the Senegal-Niger colony.

French settlement began as early as 1637, but the colony was taken by the English in 1756 and, except in 1779, held till 1815, when it passed permanently into the hands of France. Progress began in 1854, and prosperity has grown ever since. The colony is self-supporting. The chief towns have schools with over 2,000 pupils. The natives cultivate maize, millet and rice. Other products include castor-beans, cocoanuts, ground-nuts, gums, kola and rubber. The domestic animals are camels, cattle, goats and sheep. Copper, gold, mercury and silver are found. The industries comprise brickmaking, jewelry, pottery and weaving. The imports in 1905 were valued at 53,314,778 francs, the exports at 24,504,355 francs. There are nearly 600 miles of railway 1,241 of telegraph and about 200 of telephone. A submarine cable has connected Dakar with Brest, France, since April of 1905. Dakar also has regular steamship-service to French ports, Hamburg and Liverpool. The chief railroad is the line along the coast that connects Dakar, Rufisque and St. Louis. Another runs from Kayes, the head of flood-navigation on Senegal River (490 miles from St. Louis), to the Niger, so that one can go from Paris to Timbuktu by train and steamer. At Dakar extensive improvements, including a dry-dock, are under way.

Sénégal (*sĕn'ê-gal'*), a river of West Africa, has two sources, the Bafing and the Bakhoy.

These streams meet at Bafulabé, 700 miles from the coast, the united Senegal reaching the Atlantic ten miles befow St. Louis. From July to October the river is navigable to within 40 miles of Bafulabé, but the channel has many falls, narrows and low, flat islands. The mouth is being dredged and deepened. A railroad has been built along the left bank for 82 miles from Kayes to Bafulabé, which has been carried to Bamaku on the Niger.

Senegambia-Niger (*sĕn'ê-găm'bĭ-à-nī'jẽr*) since 1902 consists of territories under the administration of the governor-general of French West Africa, and includes some of the older Senegal protectorates, the remnants of the former French Sudan and the Military Territory. (The name "Senegambia" is not used by the French.) It is divided into two parts, one including the old Senegal protectorates as far as Falémé River. The other is bounded on the north by the Algerian sphere, on the west by Falémé River and French Guinea, on the south by the Ivory Coast, Gold Coast, Togoland, Dahomé to the Niger and its left bank to Northern Nigeria, and on the east by the Military Territory from Lake Chad. It therefore includes the valley of the upper Senegal, two thirds of the entire course of the Niger, taking in the great bend and the countries enclosed, and Sahara north to the Algerian sphere of influence. The area is 370,000 square miles, the population 8,000,000. It is all under civil administration, with its budget balancing in 1907 at 6,963,500 francs, and has a regular judicial and educational system, a complete system of telegraph lines, good roads between all important centers and the Senegal-Niger railway completed from Kayes through Bamaku to Kulikoro, 349 miles. In 1905 the expenditure for railway construction amounted to 688,000 francs.

Senn, Nicholas, an eminent surgeon, was born in Switzerland in 1844, and brought to the United States in 1853. He was educated in the public schools of Wisconsin, and graduated from Chicago Medical College in 1868 and from the University of Munich in 1878. He practiced his profession in Milwaukee and Chicago, where he was connected with the best medical schools and societies and gained a wide reputation. He was delegate to the International Medical Congress at Berlin in 1890, Moscow in 1897 and Madrid in 1903. He was the author of many works on medical and allied subjects — among them *Medico-Surgical Aspects of the Spanish-American War* and *Our National Recreation Parks*. His death occurred in Chicago in 1908.

Sennacherib (*sĕn-năk'ê-rĭb*), an Assyrian king, son of Sargon, reigned from 705 to 681 B. C. He built the embankment of the Tigris, made canals and water-courses, built a huge palace at Nineveh, and was the founder of many other public works. See ASSYRIA.

Sen'sitive Plants. All plants are more or less sensitive, that is, able to respond to stimuli. Some plants, however, respond so quickly and so evidently that they have been popularly called sensitive plants. Conspicuous among them are species of mimosa, acacia and their allies, members of the pea family. These particular plants have large, compound leaves composed of numerous and very small leaflets. At a sudden touch the paired leaflets fold together, or the whole leaf may fold up and its petiole droop. In the natural surroundings of these plants this folding of the leaves has to do with the avoidance of too intense light or drought, the surface of exposure thus being diminished in exact proportion to the need.

Seoul (*se-ōōl'*), capital of Korea (*q.v.*), is on the Han, 75 miles from its entrance into the Yellow Sea. It is in a basin in the midst of granite hills and is surrounded by a wall. Narrow, dirty streets; wide, open squares; poorly built houses; and a royal palace covering 600 acres make the city. Silk, paper, tobacco, mats and fans are produced. Population 196,646.

Se'pal (in plants), one of the parts which together make up the calyx or outer set of floral leaves. See FLOWER.

(*s, s*) SEPALS

Separator, Cream. See CREAM-SEPARATOR.

Se'poy, a native Hindu soldier, as distinguished from a *gora* or white soldier. Sepoys have always been volunteers. The French first employed them in the 18th century. The East India Company had 10,000 Sepoys at the time of the battle of Plassy. This force had grown to 45,000 by the time the first governor-general was appointed (1773). Their discipline, faithfulness and good services caused general belief in their loyalty until the outbreak of the Sepoy rebellion in 1857. The army was then 300,000 strong, all Sepoys but 40,000. The rising took place among the high-caste Hindus, who made up the Bengal army. The Sepoy forces of Madras, Bombay and the Punjab took no part in it. This rebellion cost the British $200,000,000. Since 1857 the proportion of Sepoys to Europeans is less, it being now two to one instead of six to one.

Septem'ber, from the Latin word meaning seven, was the seventh month of the Roman calendar, but is the ninth according to our reckoning. The Anglo-Saxons called it *gerst-monath* or barley-month.

Sequoia (*sê-kwoi'à*), a genus of the Conifers, whose two species are native only in California. They are the famous redwoods or Big Trees and form one of the attractions to visitors in California. The species

are *S. sempervirens*, the true redwood, and *S. gigantea*, the giant redwood. The former grows only in the Coast Ranges, and is abundant enough to be a very important lumber tree. The recorded sizes are from 50 to 75 feet in circumference and 200 to 300 feet in height. It is one of the most important timber-trees in the world. The Pacific coast is supplied by the redwood with much of its building and fencing lumber. The tree does not thrive away from the sea-fog, all redwood forests being in a strip 20 to 25 miles wide and in length 500 miles. It has marvelous reproductive powers; persistently throws up shoots when cut or fallen, resists fire well, and quickly makes new forests. The giant redwood occurs in groves in a narrow strip along the western slope of the Sierra Nevada. Among the most famous groves are those of Calaveras County and the Mariposa grove just south of the Yosemite. The latter contains one of the largest standing trees, known as the Grizzly Giant, whose trunk at the ground is more than 93 feet in circumference. The age of the largest trees is from 2,000 to 2,500 years. In former ages sequoias were widely distributed throughout the world. As the last survivors of a very ancient and wonderful family, as well as for their own majesty, they are of the greatest interest and value. Nevertheless, many of the giant redwoods of private ownership have been sacrificed for money. A recent benefaction of a public-spirited citizen, William Kent of Chicago, has provided for the preservation, some few miles out from San Francisco, of a tract heavily wooded with virgin timber, chiefly redwood and Douglas fir. Mr. Kent purchased the forest with the purpose of having it established as a government reserve, and in January of 1908 the government accepted the generous offer; and Muir Woods, the name given to the beautiful cañon forest by the donor, now belong to the nation. See FOREST-RESERVES and MUIR, JOHN.

Sera'pis, the Greek name of an Egyptian god, introduced into Egypt in the time of Ptolemy Soter. He was a combination of the Greek Hades and the Egyptian Osiris. It is said that 42 temples were built for the worship of this god, though they were admitted only into the Greek cities founded in Egypt. The best known of these temples was the magnificent Serapeum at Alexandria, to which was joined the celebrated Alexandrine Library. Antoninus Pius introduced the worship of Serapis into Rome, but it was soon abolished. Many Roman coins have his image joined to that of Isis. The worship of Serapis ceased in Egypt only when his image in Alexandria was destroyed by its Christian archbishop in 398 A. D.

Serf. See SLAVERY.

Ser'pentine, a mineral made up of silica, magnesia and water, with a little protoxide of iron. Serpentine is usually found in masses, never in crystals; is generally some shade of green, but sometimes is red or brownish-yellow; and feels smooth, but often greasy. Precious or noble serpentine is a rich, dark green, hard enough to take a good polish, translucent and sometimes having garnets imbedded, which form red spots and add to its beauty. It is a rather rare mineral, and is found at Baireuth (Germany), in Corsica and in the Shetland Islands. The Romans made of it beautiful pillars; and boxes, vases etc. are still cut from it. Marmolite is a scaly serpentine; chrysolite is a kind with delicate fibers and a silky luster. Common serpentine is a rock rather than a mineral. Its name comes from its being often marked with winding veins. Its color usually is green or red, often mottled, veined or clouded.

Ser'pents. See SNAKES.

Serpent-Wor'ship is one of the oldest forms of religion, and still exists among many savage peoples. Serpent-worship is prominent in Hinduism. We see traces of it in the great serpent which defended the citadel of Athens, fed every month with honey-cakes. Among Zulus harmless green or brown snakes which come boldly into the houses are thought to be ancestors, and are often identified by some scar or mark, such as the man bore in life. Serpents are often looked upon as the embodiment of gods, as was the rattlesnake worshiped in the Natchez temple of the Sun; the Phœnician serpent with its tail in its mouth, an emblem of eternity. Reverence for the serpent is notable among the American Indians, where its name has been given to rivers, as the Kennebec and the Antietam. Among the Dakotas, Shawnees and Sacs the words for spirit and snake are similar. The Algonquins think the lightning a huge snake, and the Caribs speak of the god of the thunder-storm as a mighty serpent. The Ojibways dread to kill a rattlesnake, and, if they find one in their path, beseech it to go away and spare them and their families. The same worship is found among the Cherokees and other tribes as well as in the strange snake-dances of the Zuñis. See Fergusson's *Tree and Serpent Worship*.

Se'rum. The blood in the bloodvessels consists of two parts: the solid, which includes both kinds of corpuscles, and the liquid, called the plasma. When blood escapes from the bloodvessels, it first becomes viscid or like a jelly. If this jelly-like mass is left standing some time, it separates into two parts, a liquid, which is the serum, and a solid clot which floats upon the serum. Now, the clot is found to contain practically all the corpuscles and also a network of fine threads called fibrin. Hence, as the cor-

puscles were there before, we must conclude that the plasma, which is liquid in the body, has now separated into two parts,—fibrin and serum. Serum, as a separate substance, therefore, is never found in the body; and its functions are included in those of the plasma. But in modern medicine a distinct branch of therapeutics or the science of healing takes advantage of the fact that healthy serum possesses power to fight with and destroy certain dangerous bacteria. In vaccination for smallpox the poison of the disease is itself introduced directly into the body, and the blood in the body develops power to destroy this small amount of poison. In so doing it retains power to fight a later infection of the disease itself, because the *antitoxin* or *poison-fighting* substance thus developed in the body remains there for some time. Now, if we infect, for example, a horse with a disease, as pneumonia, the animal's blood develops this power to fight the disease; and if we slowly increase the infection the blood slowly acquires a very great *antitoxin* power. If we then remove some of the blood and secure the serum as above, the antitoxin power is in the serum. Antitoxin serum has been of more use in diphtheria than in any other disease. Children suffering from diphtheria die in 35 to 40% of cases; but where the antitoxin serum for diphtheria is injected while they are suffering from the disease, they die only in 9 to 13% of the cases. Tetanus (lockjaw) was fatal in practically 100% of cases; but antitetanic serum has reduced the mortality to about 35%. The method is of no use, it seems, in some diseases, as cancer, and of little if any service in others, as tuberculosis.

Servia (*sĕr'vĭ-ȧ*), a kingdom of the Balkan peninsula, reaching from Hungary on the north to Turkey on the south and from Bosnia on the west to Bulgaria and Rumania on the east. It covers 18,650 square miles, measuring 140 miles from east to west and 110 from north to south. It on the whole is a mountainous country, covered with fine forests. Servia is an agricultural country. Wheat, corn, grapes and plums are the chief crops. Cattle, sheep and acorn-fed hogs are exported, as are also hides, wool, timber and cordage. The foreign trade is mostly in the hands of Austria-Hungary, and its center is at Belgrade, the capital (population 80,747). Manufactures are not of great value, but are fostered by government gifts of monopolies.

The Servians are a well-built, stalwart race. They cling to old customs and beliefs, and are democratic in their institutions. The farms are of small size. There are no paupers, asylums or "homes." Population 2,688,747, including 89,873 Rumanians and 46,148 gypsies. Besides these there are 250,000 Servians in Montenegro, 1,300,000 in Herzegovina and 2,350,000 in Austria-Hungary. The people belong to the Greek-Orthodox church.

Servia is a constitutional and hereditary monarchy. The king rules through eight ministers, who are accountable to the people. There also are a national assembly and a senate. The army takes in all capable of bearing arms between 20 and 50, divided into the standing army, in peace 27,500, in war 110,000, and the second and third classes of national militia, numbering 175,000. This is the full average military strength.

Elementary education is compulsory. In 1904 there were 1,267 elementary schools, with 2,219 teachers and 122,278 pupils; 18 higher schools, with 317 teachers and 5,398 students. The university at Belgrade has 60 instructors and 490 students. Servia has 394 miles of railway and 2,040 miles of telegraph line.

The Servians came from the slopes of the Carpathians to Servia, Bosnia and Herzegovina in 638, and soon accepted Christianity. Under their feudal lords they on the whole withstood the Byzantine empire and the Bulgarians. The Rascian dynasty was founded in 1159. Its greatest prince was Stephan Dushan (1336-56), who conquered Bulgaria, Macedonia and Albania, and thought of welding Servia, Bulgaria and Byzantium into a power strong enough to withstand the Turks. But he died before anything could be done, and left a feeble son. By the loss of two battles to the Turks, that on the Maritza in 1371 and the Field of the Blackbirds in 1389, Servia lost its independence. Then followed 300 years of Turkish cruelty, many chief families being blotted out, 200,000 people carried off as slaves, while the boys every seven years were forced to become Moslems and janizaries. In 1718 Austria won Servia from Turkey, but had to give it up 21 years later. In 1804 the people rose under Czerny George or Black George, a wealthy swine-owner, who stormed and took Belgrade and drove the janizaries out of the country. In 1809 and 1810 the Turks were beaten off only with the help of the Russians, who agreed by treaty that the sultan should garrison the country but that the Servians should manage their home affairs themselves. The Turks broke the treaty, and Czerny George fled to Austria; but in 1815 a new leader, Milosh Obrenovitch, a herdsman, confined the Turks to their garrisons. He had his rival, Czerny George, murdered, and by 1829 was acknowledged prince of Servia. His rule was very despotic, and in 1839 he was forced to yield the throne to his son, Milan, who was soon succeeded by his brother, Michael. Three years later the rival faction replaced Michael by Alexander, the son of Czerny George, a weak ruler, who was driven out in 1859. The aged Milosh Obrenovitch

was again made prince and was soon succeeded by his son, Michael. His rule was able, and in 1867 the last Turkish garrison was withdrawn. A year later he was assassinated. His cousin, Milan (1868-89), took part in the Russo-Turkish War of 1877-8, whereby Servia gained her independence, and was crowned king as Milan I in 1882. In 1889 he gave up the throne to his son, Alexander, then 13 years old. On June 11, 1903, King Alexander and Queen Draga were assassinated, and Peter Karageorgevitch succeeded to the throne on June 25th. Consult Laveleye's *Balkan Peninsula*, and see PETER I OF SERVIA.

Sesostris (*sĕ-sŏs'trĭs*), the Greek name of a celebrated Egyptian king. According to the Greek accounts, Sesostris at the head of a large army invaded Libya, Arabia, Asia, Europe, Thrace and Scythia, leaving a colony at Colchis on his way home. In the south he conquered Ethiopia, and by means of his fleet on the Red Sea got possession of the neighboring islands and widened his dominions to India itself. Captives in great numbers were put to work on temples, canals and mounds. Sesostris is said to have gone blind after a reign of 33 years, and to have taken his own life. Just who this great conqueror was is a puzzle. The most reasonable explanation is that his doings are the confused exploits of Sethos I and Rameses II.

Se'ton, Ernest Thompson, lecturer, illustrator and author, was born in South Shields, England, in 1860; but spent his boyhood and youth (from 1866) in Canada and on the western plains. He was educated in Toronto, Canada, and London, England. In 1891 he became naturalist to the government of Manitoba; and wrote not only serious works upon the *Birds of Manitoba* and the *Mammals of Manitoba*, but clever and attractive tales for magazines, which purported to be based on actual observation of the ways of animal life. Mr. Seton contributed a number of illustrations to *The Century Dictionary*. He is the author and illustrator of *Art Anatomy of Animals; Wild Animals I have Known; The Trail of the Sandhill Stag; The Biography of a Grizzly; Lobo, Rag and Vixen; Lives of the Hunted; Pictures of Wild Animals; Two Little Savages; and Krag and Johnny Bear.*

Set'ter, a breed of dog employed in shooting birds. There are three varieties — the English, the Gordon and the Irish setter. Dogs had been trained from the 16th century to scent game, but it was not until the beginning of the 19th century that a record of a distinct breed of setter was begun. The English setter generally is white with red markings or with black spots. The Gordon setter was bred by the duke of Gordon in 1800, by crossing the existing setter with the collie. This setter should be a rich and glossy black, marked with tan on the face, chest and legs. The origin of the Irish setter with its deep chestnut-red color is unknown. See DOG.

Sev'en Sleep'ers, the heroes of a celebrated tale. During the flight of the Christians from the persecution under Decius seven Christians of Ephesus took refuge in a cave near the city, where they were discovered by their pursuers, who walled the entrance to starve them to death. Instead they fell into a sleep which lasted from 250 or 251 to the reign of Theodosius (447). They imagined that their sleep had been but for a night. One of the seven went secretly into the city to buy food, and was thunderstuck to see the cross on churches and other buildings. Offering a coin of Decius at a bakery he was arrested, his startling story not being believed till he guided the citizens to the cave where he had left his comrades. The emperor heard enough from their lips to make him believe in the life beyond the grave, whereupon they sank again to sleep till the resurrection. The Roman church holds their festival on June 27. The story was adopted by Mohammed. A like story is told in Germany. See Rydberg's *Teutonic Mythology*.

Seven Wise Men, Greek sages, whose lives were embodied in certain maxims. Their names and characteristic sayings are as follows: Solon of Athens — "Nothing in excess"; Thales of Miletus — "Suretyship brings ruin"; Pittacus of Mitylene — "Know thine opportunity"; Bias of Priene in Ionia — "Too many workers spoil the work"; Chilon of Sparta — "Know thyself"; Cleobulus, tyrant of Lindus in Rhodes — "Moderation is the chief good"; and Periander, tyrant of Corinth — "Forethought in all things."

Seven Won'ders of the World were in early times reckoned to be the Pyramids of Egypt, the Hanging (that is, terraced) Gardens of Semiramis at Babylon, the Temple of Diana at Ephesus the Statue of Jupiter at Athens by Pheidias, the Mausoleum, the Colossus at Rhodes and the Pharos (or lighthouse) at Alexandria.

Seven Years' War (1756-63). A struggle in Europe, which had far-reaching results, between Prussia under Frederick the Great and a confederacy of European powers, consisting mainly of Austria under Empress Maria Theresa, Russia, Saxony, Sweden and France. The immediate object of the war was to enable Austria to regain possession of Silesia, duchies which had in 1740 been seized by Frederick, and this precipitated a strife known as the Seven Years' War or the third Silesian War. With Prussia was allied England under George II, who sought thus to secure his Hanoverian possessions against France, and between which and the English there had been a growing ill-feeling in consequence

of rivalry in the American colonies and in India. On the part of the confederacy of Austria, Russia and France the feeling that led to the war was European jealousy of the growing power of Prussia, whose prestige had been greatly raised by the genius of Frederick. On the outbreak of the war he made himself master of Saxony by the defeat of the Austrians at Lobositz (October, 1756), temporarily invaded Bohemia, and again inflicted defeat upon the Austrians (at Prague, May, 1757), followed by victories later in the year over the French and Austrians at Rossbach and over the Austrians alone at Leuthen (December, 1757). Through varying fortune Frederick's military genius enabled him in the two ensuing years to wrest victories from the Russians at Zorndorf and from the French at Minden, though his capital was taken by the Russians and was subjected to three days' plunder. In 1761 the English, owing to the death of George II, withdrew their subsidies to Prussia; but Frederick's straits were somewhat relieved in the following year, when Elizabeth of Russia died and Peter III, her successor, in his few months' reign made peace with Prussia. Sweden and France fell away from the alliance, and at Hubertusburg, Austria, too weak to carry on the war alone, made peace with Prussia, Feb. 15, 1763, and Silesia was confirmed as a possession of Frederick.

Aside from European complications, there was at this time, between England and France, cause enough for war in the friction between the two nations, owing to their rivalries in India and in North America and to the desire of both to settle who should be master of these vast domains. France had colonized Canada and Louisiana, while England had established colonies along that part of the Atlantic coast which separated the French settlements. To connect the latter and to exclude England from the great fur-trade of the interior, France erected military posts from Niagara River to the mouth of the Mississippi. This was naturally resented by England and her colonies, and precipitated a conflict in the Ohio Valley and on the St. Lawrence, which had its fateful issue in the conquest of Quebec and the surrender of Canada to Britain. In India English prowess met with like good fortune. The East India Company had founded settlements for trade, which gave promise of extending to an empire; but France, jealous of her hereditary rival, endeavored to snatch the prize. Dupleix, the French governor of Pondicherry, captured Madras, and by intriguing with the native princes attempted to make French power supreme over the country. In this ambitious scheme he was checkmated by Lord Clive, who from a clerkship in the East India Company rose to be one of the greatest of English generals and the savior of India. Clive captured Arcot, and in 1757, when the sovereignty of Bengal was in peril, he won a great victory over the native insurgents at Plassey, which made Bengal a British province, saved the English residents from massacre, and, in spite of the atrocity of the Black Hole at Calcutta, laid the foundations of British rule in India. The war, which raised Prussia to the front rank among European powers and developed England's colonial empire, was marked by naval victories which fell to the English, as the affairs at Louisbourg, Lagos and Quiberon Bay. Consult Carlyle's *Frederick the Great;* lives of *William Pitt, General Wolfe* and *Lord Clive;* and Parkman's *Montcalm and Wolfe.* See FRENCH AND INDIAN WAR.

Severn (*sĕv'ērn*), the second largest river of England, rises in Wales and after 210 miles falls into Bristol Channel. It is navigable for 180 miles; a canal has helped navigation from Gloucester, and is now being extended to Worcester. Below Gloucester the swiftly flowing tide produces a bore or wave five or six feet high. The Severn is a beautiful as well as an important river.

Severus (*sĕ-vē'rŭs*), **Alexander,** a Roman emperor, was born about 205 A. D. He was the adopted son of Emperor Heliogabalus, who, in his jealousy of the young man's popularity, vainly tried to kill him. Severus became emperor in 222. His first nine years were peaceful, but in 231 he began a war with the Persians, in which he was successful. In 235 he began a campaign against the Germans on the Rhine, in which he lost his life, not at the hands of the enemy, but at those of his own soldiers.

Severus, L. Septimius, a Roman emperor and a vigorous and courageous soldier, was born in Africa in 146 A. D. At the time of the murder of Pertinax (193) he was in command of an army in Pannonia and Illyria. At once proclaimed emperor, he marched on Rome, which was held by Julianus, who had obtained the throne by bribery. Julianus and the murderers of Pertinax were punished, one rival, Clodius Albinus, won by the gift of the title of Cæsar, the soldiers flattered by a rich largess, and a second rival conquered at Issus. A glorious campaign in the east and the three years' siege and capture of Byzantium were followed by a hard struggle with the jealous Clodius, whom he defeated near Lyons in 197. After the usual games to the citizens of Rome and largesses to the troops, he marched on the Parthians and took and plundered their capital. By 202 he was again in Rome, pleasing the people with shows of unheard-of magnificence and showering gold upon citizens and officers. In 208 he marched at the head of a large army to put down a rebellion in Britain, and repaired Hadrian's wall, which is often

called after him. He died at York (*Eboracum*) on Feb. 4. 211.

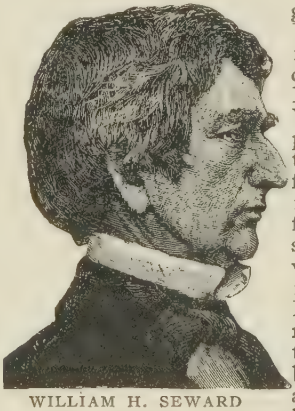
Sevier (*sē-vēr'*), **John,** American politician and celebrated pioneer and Indian-fighter, was born in Rockingham County, Virginia, in 1745; and died in Georgia in 1815. He married at 17; and at 19 founded a village in Shenandoah Valley. This settlement grew into the town of Newmarket. He was a captain in the Virginia Line during Lord Dunmore's colonial war (1774). It was he who requested the annexation to North Carolina of what is now Tennessee. After the War of the Revolution this region became ambitious for an independent government; and one was actually formed. Sevier became governor of this attempted state, which was called Franklin. North Carolina broke up the government and imprisoned Sevier. He escaped, and in 1790 was returned to Congress. He was made Tennessee's first governor when it was formed into a state (1796). This office he held until 1801; and again from 1803 to 1809. From 1811 he served four years in Congress. Sevier's death took place while he was engaged in negotiations with the Creek Indians.

Sévigné (*sā'vēn'yā'*), **Madame de,** the queen of letter-writers, was born at Paris, as Marie de Rabutin-Chantal, Feb. 6, 1626. At 18 she married a spendthrift marquis, whom she forgave and loved. At the death of her husband in 1651, she was brilliant in beauty and fascination. The prince of Conti, Turenne, Rohan and others courted her in vain. But no woman ever knew, as she did, how to change a lover into a friend, and perhaps no one ever had so many and such friends. But as to love, — that was wholly bound up in her son and daughter. The marriage of the daughter to the Count of Grignan, lieutenant-général of Provence, obliged her to live away from Paris. This separation from her daughter was the grief of Madame de Sévigné's life, but it is mainly to it that we owe those letters, extending over the 25 years till her death. These letters tell the inner history of the time in great detail; but are most valuable as mere letters, charming in their good sense, sparkling wit and inbreathed affection. The writer died on April 18, 1696. Consult Amelia Gere Mason's *Women of the French Salons*. See LETTERS.

Seville (*sā-vēl'yā*), one of the most famous Spanish cities, is on the Guadalquivir, 62 miles northeast of Cadiz. Up to a short time ago Seville had the appearance of a picturesque Moorish town — narrow shaded streets, houses built around handsome courts and gardens and fountain-studded squares. But now room has been made for wide, straight streets and modern houses and shops. The great ornament of the city is its Gothic cathedral, the second largest in the world, containing paintings by Murillo and others, a great organ, the tombs of Ferdinand III of Castile and Ferdinand the son of Columbus and fine bronze, sculptured and wood-carving work. Close beside stands the beautiful tower called Giralda, 275 feet high. Another of the glories of Seville is the Alcazar or Moorish royal palace, whose halls and gardens are surpassed only by those of the Alhambra. The museum and charity hospital contain masterpieces by Murillo. The bull-ring can accommodate 18,000 spectators. The leading manufactures are cigars, iron, machinery and pottery. Seville also is a large port of entry. The largest imports are chemicals and timber; the chief exports, lead, quicksilver, wine, copper, oranges, olives, olive-oil and corks. This city was the Roman *Hispalis*, a place of trade in those days. Under the name of *Ishbilia* from 712 to 1248 it was an important Moorish city. When Ferdinand III of Castile captured it (1248), about 300,000 Moors abandoned the place. Population 148,315. Seville or Sevilla also is a province. Area 5,428 square miles; population 555,256.

Sévres (*sā'vr'*), a small town in France, 2½ miles southwest of Paris, celebrated for its porcelain. Sèvres vases are of great value and are known the world over. Painted glass and mosaic are also made. Porcelain has been manufactured under state control since 1756. Population 8,000. See Garnier's *Soft Porcelain of Sèvres*.

Seward (*sū'ērd*), **William Henry,** was born at Florida, N. Y., May 16, 1801. He graduated at Union College in 1820, and became a lawyer. He joined the Whigs, being the party leader in the state senate from 1830 to 1834. Defeated for the governorship in 1834, he was elected in 1838 and 1840. He refused a nomination for a third term, and between 1843 and 1849, when he entered the United States senate, he gained an enviable reputation as a criminal and patent lawyer. While governor he had refused to surrender to the governor of Virginia three negro seamen, demanded on the charge of inciting a slave to escape. He was against the admission of Texas as a slave-holding state, and thus became marked as an opponent of slavery. His speech in defense of Freeman, a negro murderer, Gladstone has called "the greatest forensic effort in



WILLIAM H. SEWARD

the English language." Two terms as senator brought him to the front as an able and patriotic statesman, and when the Republican party was formed he became one of its first leaders. A strong candidate for the presidential nomination in 1860, Seward entered Lincoln's cabinet at its head, filling the office of secretary of state from 1861 to 1869. His moderation in the *Trent* affair, in which he advised giving up the envoys, as demanded by England, probably saved us from a war with Britain. His claim for damages from the English government, because of the *Alabama* being fitted out in British ports, was sustained. His most important service to the country, perhaps, was his purchase of Alaska (*q. v.*) from Russia in 1867. In the spring of 1865 Mr. Seward was thrown from his carriage, breaking his jaw and an arm. While confined to bed, on the night of Lincoln's assassination, April 14, one of the conspirators made his way to the secretary's room and severely cut his face and neck. Seward died at Auburn, N. Y., Oct. 10, 1872. Consult *Life and Letters* by his son.

Sew'erage, a system of underground pipes or conduits for the removal of sewage or the rain-water of a place. Sewerage is required for sanitary reasons in towns and cities. In the country, where population is not dense, sewage can be disposed of without any elaborate system, though care must always be taken that the water-supply is not contaminated. The construction of elaborate sewer-systems is found in ancient cities, as Babylon, Jerusalem and Rome, but it is only within recent years that it has received the attention it deserves in modern cities. There are two systems in use,—the combined and the separate system. In the combined system the same pipes carry both the sewage and the storm-water; in the separate system, called the Waring system, there are separate pipes for the sewage and for the storm-water. In the latter system the flushing is done by automatic flush-tanks supplied with water from the town waterworks. The separate system is recommended by most sanitary engineers. The liquid sewage may flow due to the fall of the pipes, but in many cases pumping has to be resorted to. Among the methods of sewerage disposal are the following: (*a*) by dilution by discharge into a large mass of flowing water which is not used for a water-supply, as at New York City and in towns on the lower Mississippi; (*b*) by running the liquid sewage over a large area of land and letting it oxidize in the air; and (*c*) by chemical treatment to kill the organic life. In some cases, as at Berlin, Germany, the sewage is used to fertilize land which is cultivated. Chicago has constructed a drainage canal at a cost of $53,000,000 to dispose of its sewage by dilution with a large body of water taken from Lake Michigan and emptied into Illinois River.

Sew'ing-Machine', a machine which takes the place of the old-fashioned needle and thread in sewing garments. Several attempts were made in England and the United States to invent a machine for sewing, but without much success until Elias Howe of Cambridge, Mass., patented his first machine in 1846. This machine uses the lock-stitch, which is used by most machines now, and from 1854 until the patents expired Howe received a royalty on every machine made, amounting to over $2,000,000. The lock-stitch makes use of two threads, one in the needle which pushes the thread down through the cloth, forming a loop; the other thread is wound on a bobbin and placed in a shuttle which carries the second thread through the loop made by the first one. The rotating hook is used instead of a shuttle in some machines. The loop-stitch is made by a curved needle, which catches the loop made by the upper needle and passes the thread through it. The most important improvement on Howe's original machine was made by Allan B. Wilson in his "four-motioned feed," which carries the work along and has been adopted in all machines. There are a large variety of machines, differing slightly, and also those made for different purposes. The family sewing-machine has revolutionized the work of the home; the button-hole machine cuts the hole, works it around, bars the ends, stops of itself when it is done, and makes 6,000 buttonholes in a day. The carpet-sewing machine, the cylinder machine for stitching mailbags, satchels, shoes, water-hose and all kinds of leather work; the universal arm-feeder machine for making gloves; the basting and quilting machine; and the pattern-stitching machine are a few of the varieties in use. The largest sewing-machine manufacturing company is the Singer, which has factories in Scotland, Austria, Canada and the United States. Since 1878, when the principal patents expired, the price of sewing-machines has been much reduced.

Sex'tant. See QUAD'RANT.

Sex'ual Spore (in plants), a spore which has been produced by the union of two gametes, that is, by fertilization. The general name of such a spore is oöspore or fertilized egg. The name is unfortunate, since the spore is not sexual, the full phrase merely meaning a sexually formed spore. See SPORE.

Seychelles (*sā'shĕl'*) **Archipelago,** 89 islands and islets belonging to Great Britain, in the Indian Ocean, off Zanzibar on the eastern coast of Africa and north of Mauritius. Their total estimated area, with dependencies, is about 150 square miles, with a population estimated at 20,767. Formerly administered from Mauritius, the

islands are under an executive council, with an administrator who has the rank of Governor. The capital is Victoria on Mahé Island, which has a good harbor and has lately been made a coaling-station. Communication with the islands is had by the steamers of the Messageries Maritimes, which ply once a month (carrying the mails) between Marseilles and Mauritius, and occasionally by the steamers of the British India Steam Navigation Company. The islands have had telegraphic communication with Mauritius and with Europe since 1893. There are good schools on the islands, with good roads on the chief islands, as Mahé, Praslin and La Digue. The imports from the Seychelles into Great Britain (chiefly of drugs) amount in value to about $150,000: the exports consist of vanilla, cocoanut-oil, soap, guano, salt-fish, tortoise-shell, coffee and cocoa. Consult Salmon's *Crown-Colonies of Great Britain* and Belcher's *Account of the Seychelles*.

Sey'mour, Hora'tio, was born at Pompey, N. Y., May 31, 1810. He studied at a military school and became a lawyer. In 1841 he entered the New York assembly as a Democrat, and was three times re-elected, in 1845 being chosen speaker. Defeated for governor in 1850, he was elected by a large majority two years later. Seymour came into great prominence as one of New York's war-governors, holding this office during the draft-riots in New York City. He presided over the Democratic national convention of 1868, which was held in New York City. He had refused to be a candidate, but on the 22d ballot was nominated for the presidency by a sudden wave of enthusiasm, in spite of his loudly spoken protestations. He, however, received but 80 electoral votes. He died at Utica, N. Y., Feb. 12, 1886.

Sforza (*sfôr'tsȧ*), **Frances'co,** when 23 succeeded his father, Muzio Attendolo, the founder of the family, who was called Sforza, meaning "stormer" (of cities), in command of a famous band of *condottiere*, soldiers who sold their swords to the highest bidder. He fought at times for and against the pope, Milan, Venice, and Florence. He invented a better system of tactics than had been in use, and it soon came to be taken for granted that victory was certain for the party which had his support. So it came about naturally that the peasant chief won the hand of Bianca, the only child of the duke of Milan. Meanwhile Sforza wrested Ancona and Pesaro from the pope. At the death of his father-in-law in 1450, he gained the dukedom by a combination of stratagem and force. He made firm his authority over all Lombardy and several districts south of the Po, gained the favor of Louis XI, who gave him Savona and Genoa, and won the love of all his subjects. Though himself ignorant, he loved and protected letters. Sforza died on March 8, 1466, and was followed by five dukes of his family.

Shad, an important food-fish belonging to the herring family. The American shad is more valued than the European species. It ranges along the Atlantic coast from New England to the Gulf of Mexico, and ascends different rivers to spawn. This species has been successfully introduced on the Pacific coast. The full-grown fish is about 30 inches long. Its color is bluish, with silvery sides and usually a dark blotch behind the gill-covers and, often, several in a row behind this. These fish were among the first to be protected and artificially propagated by the United States Fish Commission. The result of this care was to increase their numbers greatly. Statistics show that the catch of shad in 1890 was two and one half times that of 1880.

Shad'dock, a native tree of the East Indies, which has been long grown in southern Europe. Its name is said to come from Captain Shaddock, who introduced it into the West Indies in 1810. It has large, white flowers, and its fruit also is very large, sometimes weighing from 10 to 14 pounds, roundish and pale yellow. The pulp is green and watery, and has a slight acid taste. Finer and smaller than the shaddock proper is the pomelo (also called pummelo, pompelmoose and grapefruit), a variety rather larger than an orange, which bears its fruit in clusters. Both kinds are grown in Florida and sold in the north.

Shad'ow, in optics the region immediately behind an opaque object which cannot be illuminated by a source of light in front of the opaque object. If the source of light is a single point, we find that the shadow is geometrically similar to the outline of the opaque object, which is a consequence of the fact that light moves in straight lines in a homogenous medium. Such a shadow is exhibited in Fig. 1. In case the luminous source is not a single point, but an extended body, we find that the shadow consists of two parts, one a

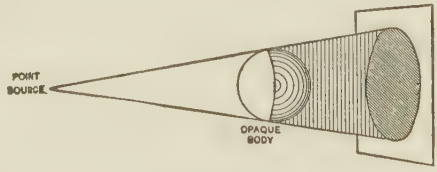


FIG. 1

central, dark area, called the *umbra*, the other a partly illuminated border, called the *penumbra*. This is well-illustrated in the case of the sun and earth shown in Fig. 2. The penumbra, as will be evident from the figure, is merely that region which is illuminated by some but not all points on the luminous source. The more nearly

a source approximates a point, the more nearly does the penumbra vanish. This almost complete absence of penumbra is well-shown in the shadows cast by naked electric arcs. In case a shadow is produced

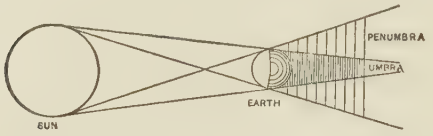


FIG. 2

by a point-source it is always accompanied by a series of diffraction-fringes, called, after their discoverer, Grimaldi's fringes. These are beautifully shown in the case of the naked arc-light, where the first three fringes of the series are easily seen bordering the shadow of each twig on a tree or the shadow of one's lead-pencil cast on a sheet of white paper. For explanation of these fringes see Preston's *Theory of Light.*

Shaf'ter, William Rufus, American general, was born at Galesburg, Mich., Oct. 16 1835. In 1861 he entered the Union army as lieutenant in the 7th regiment of Michigan volunteers, and distinguished himself in the campaigns under McClellan in Virginia. He rose to be lieutenant-colonel and subsequently was brevetted brigadier-general for gallantry in action. When the volunteer army was disbanded at the close of the Civil War, he entered the regular army as lieutenant-colonel of the 41st United States infantry. After this he rose to be colonel, and then brigadier-general in 1897 On the outbreak of the war with Spain (*q. v.*) he was put in command of an expedition to Cuba (*q. v.*) with the rank of major-general of volunteers. In May 1898, he proceeded to Tampa, Fla., then to Cuba, where, in June and July, he commanded the military operations which ended in the capitulation of Santiago (*q. v.*) de Cuba and the surrender of General Linares' army of over 20,000 men. He subsequently was in command of the department of California and the Columbia, and was retired on June 30, 1901. He died on Nov. 12, 1906. See SPANISH-AMERICAN WAR.

Shag. See COR'MORANT.

Shagreen', a name given to the skins of sharks, rays and other fish of the same family. These skins have a covering of small, hard grains, which stand wear better than ordinary leather. Such skins, when prepared like parchment and dyed and smoothed, have an attractive look, and are used for covering small caskets, cigar-cases, spectacle-cases and small boxes. The name "shagreen," a Persian word meaning the back of a beast of burden, is also, and perhaps was first, given to skins of horses, asses and other animals, prepared by unhairing and scraping them. Each piece is then stretched on a frame; and, while still moist, the seeds of a kind of chenopodium are sprinkled on the surface and forced in by the feet or a press. When the skin is dry, the seeds are beaten out, leaving a pitted appearance. It is then pared down and placed in water, till the pits swell and give the skin a pimpled look, like that of the shark. The covers of old Persian manuscripts are made of this shagreen, which is also used in the east for horse-trappings and shoes. Wood is embossed sometimes in a like way.

Shah, the title applied by Europeans to the ruler of Persia. It is a general name for king, widely used in southern and central Asia. The full Persian form is *Padishah.*

Shah-Jehan', the fifth of the Mogul emperors of Delhi. For the last four years of the reign of his father, Emperor Jahangir, he was in open rebellion. Greeted as emperor by the nobles on Jahangir's death in 1627, he began a warlike and successful reign, conquering the Deccan kings of Ahmadnagur, Bijapur and Golconda. He was an able and just ruler, and a good business-manager as well. The magnificence of his court was unequaled. The splendid peacock-throne was built by his orders at a cost of nearly $35,000,000. Of other great public buildings which remain as a monument of his greatness are the grand *Taj-Mahal* (*q. v.*) and the matchless pearl-mosque at Agra and the palace and great mosque at Delhi. He was deposed in 1658 by Aurungzeb, his son, and died in 1666.

Shah'jahan'pur, a city of British India, in the northwestern provinces, is 100 miles northwest of Lucknow. It takes its name from Shah-Jehan, in whose reign it was founded in 1647. It was a hotbed of rebellion during the mutiny of 1857-8. Sugar is made and exported here. Population 76,458.

Shak'ers, a religious sect. They arose in England about the middle of the 18th century, under the leadership of James Wardlaw and his wife. They were Quakers, but professed to have had a revelation that the second coming of Christ was at hand and that he would appear in the form of a woman. Ann Lee was one of their first converts, and her preaching drew such crowds that she and the Wardlaws were imprisoned. While in prison she professed to have received another revelation, which made her accepted as the female Christ whose reign had been promised. She was called Mother Lee, and is considered the head of the Shakers. The new kingdom, by revelation they learned, was to be set up in America, and the first settlement was made in Albany County, New York, five miles from Albany. Their special doctrines are holding property in common; celibacy or refraining from marriage; and the duty of labor. They live in families of brothers and sisters, presided over by elders and elderesses

and deacons and deaconesses. They are very neat and industrious, and are known for their flower-seeds and herbs which they raise for market. They make use of singing and dancing in their worship, which has given them their name, their own title being the United Society of Believers in Christ's Second Appearing. They have 15 settlements in the United States, several of them called Lebanon, from New Lebanon, N. Y., which was the second established in the country. Their property is valued at $10,000,000, and they number 1,000 members. See LEE, ANN, and Evans's *The Shakers*.

Shake'speare, William, the world's greatest poet and dramatist, was born at Stratford-on-Avon, England, near the end of April, 1564, the oldest son and third child of John Shakespeare. He probably went to free school at Stratford. In 1578 his father, who could not sign his own name but had risen to be high bailiff of Stratford, began to lose money. It is thought that soon after this William was taken out of school, and either apprenticed to a butcher or else worked as a lawyer's clerk. In 1582 Shakespeare married Anne Hathaway. He had three children: a daughter, Susanna, and twins — a boy, Hammet, who died when 12, and a girl, Judith. Both daughters outlived their father. A story has come to us, whether true or not is not known, that Shakespeare's first attempt at poetry was a ballad at the expense of Sir Thomas Lucy, whose deer-park the poet with some companions had robbed. The angry squire had prosecuted him, hence the satirical ballad. This unfortunate piece of poetry only made matters worse, and is said to have caused him to run off to London. Here, according to one account, he was employed holding at the playhouse-door the horses of those theater-goers who came without their servants. However, we know nothing certain of this part of his life. But in 1592 we find a reference to him in Henry Chettle's pamphlet, *Kind-Harts Dream*, which appeared in that year. Chettle speaks of him as "exelent in the qualitie he professes"— that is, acting — and praises his "uprightness of deeling" and "his facetious grace in writing." In spite, though, of Chettle's approval, it is certain that Shakespeare was not great as an actor. He did, indeed, have the pleasure of playing several times before Queen Elizabeth, whom he compliments in *Midsummer Night's Dream*. However, the great poet was not himself a mere dreamer. He soon became a theatrical shareholder, by 1597 was able to buy a home at Stratford, and in 1602 purchased a place of 107 acres near by.

WILLIAM SHAKESPEARE

Probably in 1589-90 Shakespeare began his career as a playwright. Among his earliest comedies were *Love's Labour's Lost, The Comedy of Errors* and *The Two Gentlemen of Verona;* among his earliest historical dramas were the second and third parts of *Henry VI, King Richard III* and *King Richard II;* the first romantic tragedy was *Romeo and Juliet*. The other two early plays of *Titus Andronicus* and the *First Part of Henry VI*, were, it is thought, partly the work of other hands. This greatest of series of plays thus begun was ended by *King Henry VIII* (1612-13), which critics think was written in part by Fletcher.

While writing, Shakespeare still continued to act; he is known to have played a part in Jonson's *Sejanus* in 1603 or 1604, but it is not known when he left the stage. Shakespeare died at Stratford-on-Avon, April 23, 1616, which is supposed to have been the anniversary of his birthday. See Morley's *English Literature;* Brandes's *Wm. Shakespeare;* Moulton's and R. G. White's *Studies;* and Sidney Lee's *Life*.

Shale, a variety of sedimentary rock formed from beds of mud or clay. The mud or clay was originally deposited in lakes or in the sea. Compacted by its own weight or by the weight of sediments laid down above it, and cemented by mineral matter deposited from solution by the waters percolating through it, the mud or clay becomes shale. Shales are of various degrees of hardness according to the degree of cementation, compression etc. Some shale breaks into slabs appropriate for the construction of walks. Such shale is *flagstone*. Shale occurs in rock-systems of all ages later than Archean (See GEOLOGY.) Soft shale is often ground into clay for the manufacture of brick, tiles etc. When subjected to compression great enough to render it partially metamorphic, shale is converted into slate. If the metamorphism go still further, shale may be converted into crystalline schist, as mica-schist.

Sha'ler, Nathaniel Southgate, American geologist and paleontologist, was born at Newport, Ky., Feb. 22, 1841, and graduated at Lawrence Scientific School, Harvard, of which he was dean and professor of geology. After 1884 he also was geologist in charge of the Atlantic division of the United States geological survey and member of the National Academy of Sciences. For seven years (1873-80) he had charge of the geological survey of Kentucky, devoting part of each year to that work, and publishing many volumes as the result of his labors. His writings embrace *Nature and Man in North America; Aspects of the Earth; The Story of Our Continent; Sea and Land; A First Book in Geology; The Interpretation*

of Nature; Features of Coasts and Oceans; and *Kentucky.* His death occurred on April 10, 1906.

Shamo'kin, Pa., a borough of Northumberland County, eastern central Pennsylvania, 20 miles south of Danville, Montour County, and 18 southeast of Sunbury, the county-seat. It is on the Northern Central and Reading railroads, in the center of the great anthracite region. It contains manufactories, machine-shops, foundries, flour and planing mills and other industries. The town has good schools, several churches, a public library and all improvements of a progressive place. Population 20,482.

Sham'rock, a ternate-leaved plant, adopted by the Irish as their national emblem. There have been many warm disputes to determine the veritable shamrock. Some writers contend for the woodsorrel, the leaves of which unfold about St. Patrick's Day, while others claim that the white clover is the favored plant. Legends make out that St. Patrick (*q. v.*), when preaching the Gospel to the benighted inhabitants of Ireland, illustrated the great doctrines of the trinity by the triple leaf of the shamrock. The leaf of the white clover is the one now generally worn by Irishmen on St. Patrick's Day.

Shanghai (*shăng-hä'ĭ*), a city in central China, in the province of Kiangsu and its most important seaport, is 12 miles from the mouth of the Yangtse-Kiang. The Chinese part of the city has narrow, dirty streets, and is surrounded by a wall, with crowded suburbs. The French and English portions on the north, parallel with the river, are well-lighted and paved, with handsome houses and fine public buildings. The city is strongly fortified. Shanghai was opened to foreign commerce in 1842, and has a large trade with Great Britain, Hong-Kong, India and the United States in silk, tea, cotton, rice, sugar, paper, hemp, wheat, oils, flower and fruit-seeds, fans and medicines. About 2,900 vessels enter the port annually. Population 651,000.

Shan'ly, Charles Dawson, poet, humorist and engineer, was born in Dublin, Ireland, March 9, 1811, and educated at Trinity College. He came to Canada and settled near London, Ont., in 1836, soon afterwards editing *Punch in Canada.* He was the engineer of Hoosac Tunnel, and well-known both in Canada and the United States as a humorist, art-critic and writer of ballads and serious as well as lighter verse. He died in Florida, while in search of health, on April 15, 1875.

Shan'non, the largest river of Ireland, rises in Cuilcagh Mountains and flows into the Atlantic on the southwestern coast of Ireland. From Limerick to the sea, a distance of 70 miles, it forms an estuary or inlet ten miles wide at the sea. Large vessels can reach Limerick, and smaller ones ascend as far as Athlone, while two canals connect the river with Dublin.

Shans, a group of tribes living on the borders of Burma, Siam and China. They are descended from one of the original races of China, and have been pushed southward, entering the valley of the Irawadi about the 6th century. The Shans and the Laos (*q. v.*) are the same people, and both are closely related to the Siamese. They are a lazy, gay people, fond of gambling and cock-fighting, though not unwarlike. The women enjoy equal freedom with the men; slavery in a mild form exists; and serfdom is universal. Their religion is Buddhism. Their country is a succession of wide river-valleys separated by ridges, with extensive forests of teak and with iron, rubies, silver, gold, copper, coal and petroleum among its minerals. Trade is largely in the hands of the Chinese, but the Siamese are noted for their chased work in gold and silver. The first important Shan state was the Mau kingdom, whose ruler conquered Burma and parts of Siam and the Malay Peninsula. Mau princes ruled until 1554, when most of the Shan states became tributary to the emperor of Pegu. In 1774-7 Siam (*q. v.*) conquered the southern states. The Shans governed by Siam are estimated at 2,000,000, but the numbers ruled by China and those of the independent tribes are unknown. The Shans in the native territories of British India number approximately 238,000. The area of the Shan states is 68,165 square miles. See Colquhoun's *Among the Shans* and Cheek's *Siam and Laos.*

Shark, any member of a large group of cartilaginous fishes with external gill-clefts. The sharks, rays and skates are united into a large subclass of fishes called *Selachii.* The sharks have gill-openings along the sides of the neck, while the rays and skates have them on the under surface of the expanded head. Sharks vary in size from the dogfishes (*q. v.*), about three feet long, to the basking shark, 35 or 40 feet long. They are very voracious and destroy many fish. With four exceptions all are carnivorous. They are more numerous in warm seas, but are widely distributed. The white shark, which reaches 25 feet, is the so-called man-eater. These animals are common in warm seas and occasionally wander to our coasts. They follow ships for great distances to obtain the refuse thrown overboard. The blue shark, from 15 to 20 feet long, shares the title of man-eater with the foregoing. Among the sharks found along the Atlantic

WHITE SHARK

coast of the United States are the dogfish sharks, about 3 feet long; the sand-sharks, about 6 feet long; the mackerel-sharks, 8 to 15 feet long; the hammerhead sharks, 15 to 20 feet long; the small hammerheads, 3 to 5 feet long; the thresher-sharks, about 20 feet long; and other sharks that appear occasionally. The sharks represent a very ancient family of fishes, with many clues to ancestral history. Their development is of special interest to naturalists. Their fin-rays are used in China for making gelatine, their livers produce oil, and their rough skin, called shagreen (*q. v.*), was formerly used in place of sandpaper.

Shar'on, Pa., a borough in Mercer County, on Shenango River and on the Erie and Pennsylvania and Lake Shore and Mich. Southern railways, about 70 miles northwest of Pittsburgh. Settled in 1795, the place was incorporated as a borough in 1841. It has rolling-mills, coke, steel, brass and cement works, an ordnance-foundry, nail, chain and stove works, lumber, planing and flour mills, besides manufactories of malleable-steel castings, explosives, tinware and brick and tile works. Natural gas is found in the region, which is also rich in coal and iron. Besides its churches, public offices and schools, it also has Hall Institute (Baptist), a secondary school. Population 11,909.

Shaw, Albert, editor of *The American Monthly Review of Reviews*, was born at Shandon, Butler County, Ohio, in 1857. He graduated from Iowa College, Grinnell, Iowa, in 1897. While an undergraduate he showed an aptitude for literary work and was one of the editors of the college-paper. Later he owned and published a newspaper at Grinnell. He took his Ph. D. at Johns Hopkins in history and political science in 1884. Dr. Shaw's graduate-work attracted the attention of James Bryce, then preparing *The American Commonwealth*, and to him Mr. Shaw's knowledge of politics in the west was of great service. In reciprocation Mr. Bryce gave the latter access to such English periodicals as *The Contemporary* and *The Fortnightly Review*, to both of which he has since contributed many articles. He studied in Europe in 1888-9 and in 1891. In the latter year he became editor of *The American Review of Reviews*. He is a member of many learned societies. He has delivered many lectures upon the problems of municipal government at the best-known universities. Among his publications are *Local Government in Illinois; Co-operation in The Northwest; Municipal Government in Great Britain;* and *Iowa* in the American Commonwealth Series.

Shaw, George Bernard, critic, essayist and dramatist, was born in Dublin, Ireland, in 1856. In 1876 he settled in London. In 1884 he became a member of the Fabian Society. To *The Star*, *The World* and *The Saturday Review* he contributed weekly articles on music and the theater. Mr. Shaw's plays are writings of a somewhat revolutionary character in that he is dissatisfied with existing social conventions. Among his novels are *The Irrational Knot*, *Love Among the Artists*, *Cashel Byron's Profession* and *The Unsocial Socialist*. His plays include *Admirable Bashville*, *Plays Pleasant and Unpleasant*, *Three Plays for Puritans*, *Captain Brassbound's Conversion*, *Man and Superman*, *Mrs. Warren's Profession* and *John Bull's Other Island*. His essays include *The Quintessence of Ibsenism*, *The Perfect Wagnerite*, *Anarchism versus State Socialism*, *The Commonsense of Municipal Trading*, *Fabian Essays on Socialism* and *Dramatic Opinions and Essays*.

Shaw, Henry W., an American humorist, was born at Lanesborough, Mass., in 1818. He began to publish his humorous sketches in 1863 under the name of Josh Billings. They consist of quaint maxims, spelled by sound, and were popular. He was a favorite lecturer, and published four volumes of his sketches and a yearly *Farmers' Allminax*. He died at Monterey, Cal., Oct. 14, 1885.

Shaw, Leslie Mortimer, Secretary of the Treasury of United States from 1902 to 1907 and since then president of Carnegie Trust Company, was born at Morristown, Vt., Nov. 2, 1848. As a young man he went to Iowa to carve out his fortune. There he worked as farm-hand, schoolteacher and salesman for a nursery, paying his way through college. He graduated from Cornell College, Mt. Vernon, Iowa, in 1874 and from Iowa College of Law in 1876. He prospered as a lawyer and banker, and was elected governor of Iowa in 1898 and 1900.

Shawl, an outer garment or outside wrap, which in its present form has been used for centuries. Kashmir shawls are made of the underwool of the Kashmir goat of Tibet. The thread is very fine, selling at $10 a pound, and the colors used in dyeing are permanent, being mostly from native dyes. Some of the shawls are embroidered by hand, but many have the pattern woven into them. Three or four weavers work at one loom, with wooden needles instead of shuttles, and they work on the wrong side of the shawl, where the needles hang in rows. Five shawls are usually made in one year at one loom, though some of the more elaborate take a year in the process of manufacture. The best Kashmir shawls are very high-priced, being often valued as high as $1,500 in India. The most beautiful shawls of Persia are made of silk. The manufacture of shawls has been extensively carried on in France, mainly at Paris, Lyons and Nîmes, and also at Paisley, Scotland, and at Lowell and other places in the United States.

Shaw'nee', Okla., a city in Pottawatomie County, on the Rock Island, the Missouri Kansas and Texas, the Santa Fé, and the No. Can. railroads, about 50 miles southeast of Guthrie. Settled in 1895, it was incorporated a city in the following year. Besides its civic buildings and two large parks, it has a Carnegie Library, Curtis Industrial (free) School and a private hospital. Its industries comprise cotton-gins, cotton-compresses, cottonseed-oil mills, brick and tile works and flour-mills. There also are repair-shops of two of the local railways. Population about 18,000.

Shawnees, a tribe of American Indians, belonging to the Algonquin family, which first settled in New York, Pennsylvania and Ohio, but were driven west by the Iroquois. They helped the French against the English, and in 1812 sided with the English against the United States. They moved to Missouri, Kansas and Indian Territory.

Shays' Rebellion, a rising in Massachusetts in 1786–7 due to real and fancied grievances, takes its name from the leader, Daniel Shays, who had won the rank of captain in the Revolutionary War. The causes of the uprising were complicated. Probably the financial depression of the time was wrongly attributed to political and legal causes. The agitators objected to the heavy taxation on land, the cost of law-proceedings, the high salaries paid to state officials, the exportation of specie, the oppressive rulings of the courts and the aristocratic character of the state senate. Accordingly in several cities the courts were hindered from sitting by armed mobs. The Supreme Court session at Springfield was broken up by Shays and his followers in the face of the militia. Some concessions were made by the legislature; but the agitation was not checked until the militia fired upon an expedition which Shays was leading against the Federal arsenal. The followers of Shays fled, and after a few other skirmishes had taken place they fled for the most part from Massachusetts. Fourteen leaders were condemned to death for high treason, but pardoned. Shays was afterwards pensioned for his services in the War of the Revolution. He died in 1825.

Shear'water, a class of oceanic birds of the petrel family. They are brown birds, about a foot long, with webbed feet. They are night-birds and spend most of their time in flight, but can swim easily. Their single white egg is laid in a hole in the ground. The sooty shearwater is found on the North Atlantic, but goes south for its breeding-grounds. The great shearwater, Manx shearwater of Iceland and Greenland and the dusky shearwater found at the Bermudas and Bahamas are other varieties.

Sheboygan (*shĕ-boi'gan*), **Wis.,** a city, county-seat of Sheboygan County, is a port on Lake Michigan, at the mouth of Sheboygan River and about 53 miles north of Milwaukee. It has a good harbor. Its industries include furniture, chair, shoe and toy factories, wagon and machinery works, flour-mills, foundries and breweries. It has fine county-buildings and admirable public and parochial schools. It has all improvements of a progressive city and the service of two railroads. Population 24,239.

Sheep, a group of quadrupeds forming with the goats a natural subfamily. Wild sheep are natives of mountainous regions or of high tablelands. They live in flocks, and take to flight at the call of their leader on the approach of danger, though they can defend themselves when necessary. The ram can carry on a contest with a bull, and is always ready to attack a dog. Wild sheep have short wool, covered with long, straight hair. The great mountain-sheep found in central Asia, with horns sometimes six feet long, and the Rocky-Mountain sheep or bighorn of North America are among the largest varieties of wild sheep. The Iceland sheep, with three, four or even five horns, the broad-tailed sheep found in Asia, its tail weighing from 70 to 80 pounds and carried often on a small carriage, and the Astrakhan and Circassian sheep, remarkable for their fine wool, are noted varieties.

SOUTHDOWN

The common sheep has sprung from the wild animal, and was one of the first animals domesticated by man, as we read in *Genesis* that Abel was "a keeper of sheep." The wool was early used in making cloth, the skin for writing, the milk for a drink and the flesh for food. Sheep pasture on hilly ground, and thus can be profitably raised on land not well-adapted to raising crops. (See STOCK-RAISING.)

Sheep-raising is carried on extensively in South America, Australia, New Zealand, the western United States, portions of Russia and South Africa. The first sheep were introduced into the United States in 1609, and merino-sheep in 1801. Formerly the majority of sheep in this country were merinos; the tendency now is to increase the mutton-breeds. Owing to various reasons sheep-raising has passed through many changes here; it is now carried on chiefly in the west and middle west and is at its height in the far west — Montana, Wyoming, New Mexico, Utah, Idaho and Oregon. Formerly sheep were allowed to roam freely on the public lands, but the open range is decreasing, and more grazing-land is now owned or rented. In the west sheepmen and cattlemen have engaged in

no little conflict, contending for possession of feeding-ground for flock or herd. Sheep-shearing is done both by hand and by machinery. Expert shearers in the west travel from place to place, beginning in the south and working their way north.

Sheeps'head, a bony fish common along the Atlantic coast and regarded as one of our best food-fishes. They are distinguished by wide cutting-teeth in the front of their jaws and by grinding-teeth behind. Their food is hard-shelled animals, young oysters, other mollusks, barnacles and the like. They vary in size from two pounds in the south to fifteen in the north, but the average size is about seven pounds. They range from Cape Cod to Texas. The fresh-water drum and some other fishes are locally called sheepshead.

Shef'field, a manufacturing city of England, is situated in Yorkshire, where the Sheaf and Don Rivers unite, 38 miles south of Leeds. The town is well-built, over $2,000,000 having been spent in street improvements in 1878. The Church of St. Peter, built in the reign of Henry I; St. Mary's, with a fine spire; Albert Hall; Norfolk Market, built by the duke of Norfolk at a cost of $200,000; Music-Hall; and the new town-hall with a statue of Vulcan are among the noticeable buildings. Wesley College, Firth College, Mechanics' Institute, Athenæum, St. George's Museum, founded by Ruskin, and Mappin Art Gallery are some of its institutions. Sheffield has long been noted for its cutlery, the "Sheffield whittle or knife," being spoken of by Chaucer. The Cutlers' Company was founded in 1624, and the cutlers' annual feast dates from that time. The manufactures include brass, iron and steel articles of every kind and armor-plates, railroad-springs, tires and rails.

Sheffield from the Saxon times was the capital of a district belonging to a Norman family named Lovetot, who built a hospital, a mill and a bridge over the Don. It passed by marriage to the Furnivals, and suffered in the Wars of the Barons, the castle being burned and many of the people slaughtered. During the Wars of the Roses the Shrewsbury family, the ruling family of the county, sided with the House of Lancaster. The castle of the earls of Shrewsbury was a fortified building covering four acres of ground, and here Queen Mary of Scotland was imprisoned for 14 years. In 1644 the castle was taken by the army of Parliament, and soon after torn down. In 1864 a reservoir gave way, with terrible effect; 250 lives were lost and millions of property destroyed. Population 448,000. See Gatty's *Sheffield, Past and Present,* and Leader's *Reminiscences of Old Sheffield.*

Shel'byville, Ind., a city, seat of Shelby County, on Blue River and on the Clev., Cin., Chic. and St. Louis and Pittsburg, Cin., Chic. and St. Louis railways, 26 miles southeast of Indianapolis. Besides the city-hall, court-house and Carnegie Public Library, it has attractive buildings, including good schools and churches. It is in a good agricultural region, and ships (besides farm-products) live-stock, flour and grain. It has a varied and increasing number of industrial establishments and a rapidly extending trade. Population 7,161.

Shel'drake, a large Old-World, salt-water duck of peculiar breeding-habits. The common European sheldrake is about the size of a mallard and brilliant of plumage. The head and neck are green with a white collar, and a broad chestnut band below this, over the chest and back. The shoulders and middle of the under parts are black, the wing-spot is green, and the bill and its knob are bright carmine. These birds breed in sand-dunes, in chambers made by themselves or by rabbits. Nest-chambers, two or three feet deep, are made in a grassy hillock. Each nest-chamber is covered by a moveable lid of sod. The nest-chambers are clustered and connected by galleries provided with a common entrance. Sometimes ten or 20 nest-chambers will be found in one group. Inhabitants of the sandy islands off the western coast of Jutland plunder these nests by removing the lid. All eggs above six in number are taken, and also the soft down with which the nests are lined. The sheldrakes of the United States are mergansers or fish-ducks, and belong to a distinct group.

Shell, the hard covering of an animal or an egg. While shells exist in great variety, those of the mollusks are the most typical — for example, those of the common snail and the common clam. These shells are secreted by gland-cells in the outer covering of the animal. The outside of a clam-shell is a horny layer, differing materially from the inside, which always is pearly. There also is a middle layer, forming a large part of the shell and composed of regular prisms. The clam-shell therefore has three distinct layers'— outer, middle and inner. The inner pearly layer is secreted by cells in the general surface of the mantle, while both the outer and middle layers are formed by cells in the thickened margin of the mantle. The substance of the shell largely is carbonate of lime, but the outer layer is horny rather than limy. The immense variety of sea-shells are formed in a similar way, and the shells afford a means of identifying the animals that formed them. The shell, or *test* of the sea-urchin is made of six-sided plates of carbonate of lime, secreted by the cells of the outer covering of the body. The shell of the lobster and the crayfish, although formed by a similar process, is, nevertheless, made of a horny substance called chitin. This is also the

hard covering of beetles and other insects. The shells of eggs are formed by secreting cells within the walls of the oviduct or tube through which the egg passes before it is laid. The shell of the hen's egg has a deposit of carbonate of lime in it. Some minute animals (*Radiolaria*) have shells formed of quartz or silica, and some secrete a horny covering. The shells of mollusks have been used for money in islands of the southern Pacific, for ornaments, jewelry, for making pearl-buttons etc. The study of shells is called conchology. See Woodward's *Manual of the Mollusca*.

Shell, a hollow projectile filled with powder, which is arranged to explode at the right moment and is fired from cannon or other large guns. Shells were first made of cast iron and fired from mortars, and called bombs. Used first by the sultan of Gujarat in 1480, they were in general use by the middle of the 17th century. In 1842 Shrapnel shells, named after the inventor, were used in the Peninsular War. They are filled with bullets, instead of powder, and a small charge, just enough to open them when set on fire by a slow match or fuse. Other shells were filled with pieces of iron rings, but the Shrapnel shell is the one most used in warfare. It is especially a man-killing shell, while the common shell was used to destroy material. Carcasses are shells filled with some burning material which will set fire to buildings; hand grenades are small shells filled with gunpowder and exploded by a time-fuse, which are thrown by hand.

The making and use of breechloading and rifled artillery directed ideas about projectiles into new courses. The projectiles are loaded from behind, instead of from in front, as formerly. Consequently they can be slightly larger than the bore, if their excess in size be made of metal soft enough to be jammed into the rifling. Copper bands are fitted around the base, and these take up the rotation imparted by the grooves and effectually check the gas. The projectiles used in modern guns are the same, practically, as canister, common shell and shrapnel; except the armor-piercing shell. This was first designed by Palliser of England. It was made of chilled iron or steel, with an ogive-shaped head, and was strong as well as sharp. It was filled with powder and fitted with a percussion-fuse. Modern, armor-piercing shells are used uncapped or capped. The latest forms of common shell are made with hardened points, and are designed to carry bursting-charges equaling a twentieth of their weight and to penetrate armor at least half a caliber thick. Armor-piercing shells are made of forged and tempered chrome-steel and are intended to penetrate any thickness of armor. They are fitted with fuses that explode the shell when it hits and pierces. High explosives are sometimes used in such shells. When soft-steel caps are fitted to these chrome-steel caps, they penetrate even face-hardened armor without breaking or adhering.

The projectiles of pneumatic guns form a class by themselves. Rockets form still another class. See CANNON, PROJECTILES and SHOT.

Shel'ley, Percy Bysshe, an English poet, was born on Aug. 4, 1792, in Sussex, and studied at Eton and Oxford. At Eton he wrote two romances, and, with a fellow-student, published a volume of verse. While at Oxford with his friend, James Hogg, he published another volume of verse, and in 1811 a pamphlet on the *Necessity of Atheism*, for which the two friends were expelled from University College. These early poems are almost unknown now, and only show the erratic nature of the poet, whose mother, when a school was recommended to her as a place where a boy was taught to think for himself, exclaimed: "Think for himself! I only hope he can be taught to think as others do." At 19 he married Harriet Westbrook, a girl of 16, and lived in Edinburgh and Keswick, where he became a friend of Southey and De Quincey and a disciple of Godwin. His plans for reforming the world he started to carry out by scattering through Ireland his *Address to the Irish People* and other pamphlets and sending adrift in bottles and boxes his *Declaration of Rights*. His *Queen Mab*, written while living in Wales, where he had gone when his servant was imprisoned for nailing up his *Declaration* in public places, was at first privately distributed, because of its religious and political heresies. He left his wife in March, 1814, and in July, 1814, took a journey through France and Switzerland with Godwin's daughter Mary and Miss Clairmont, a relative. After his grandfather's death his income became fixed, and he retired to Bishopsgate near Windsor Forest, where *Alastor* was written. His *Mont Blanc* and *Hymn to Intellectual Beauty* are records of his visits to Lake Geneva, where he met Byron. After the death of his wife he married Mary Godwin, and carried on a long suit to get possession of the children of the first marriage, but was allowed only to appoint their guardians and tutors. His *Revolt of Islam* was his last work in England, which he left for Italy in 1818. At Rome, Florence, Naples, Leghorn and Pisa he spent the rest of his life, surrounded by a circle of friends, which included Byron, Trelawney and Leigh Hunt, and wrote *Prometheus Unbound*, *The Cenci*, *Adonais* and some of his finest lyrics and (in prose) a *Defense of Poetry*. Among his most beautiful minor poems are *Ode to the West Wind*, *The Cloud*, *The Sensitive Plant* and *The*

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SHELLS FROM INDIAN OCEAN.

Skylark. Shelley and Williams, his friend, were drowned in a sudden storm on the Gulf of Spezia, July 8, 1822, and the ashes of his body, which was burned in the presence of Byron, Leigh Hunt and Trelawney, were buried at Rome. See *Lives* by Dowden, Hogg, Rossetti, Sharp and Lady Shelley.

Shenandoah (*shĕn'nă-dō'ȧ*), **Pa.,** a borough of Schuylkill County, in the heart of the anthracite region, on the Lehigh Valley, Pennsylvania and Reading railroads, 13 miles northeast of Pottsville, the county-seat, and 84 northwest of Philadelphia. In the 15 colleries in the immediate neighborhood a large number of miners are employed, which greatly aids the town. It has a hat and cap factory, an underwear factory, printing-establishments, machine-shops, mining-tool works, foundries and other industries, two breweries, several banks, good schools and churches. Population 22,949.

Shenandoah, a river in Virginia, draining the valley between the Blue Ridge and the Alleghenies and running northeast 170 miles to the Potomac at Harper's Ferry. It passes through the richest part of Virginia, and was occupied by both armies, at different times, during the Civil War and was the scene of numerous battles. See SHERIDAN.

Sher'brooke, Can., county-seat of the county of that name in Quebec, is a city of 11,765, the metropolis of the eastern townships. It is at the meeting of Magog and St. Francis Rivers on the Canadian Pacific, Grand Trunk and Quebec Central railways. It is the center of an extensive lumber-trade and of numerous manufactures.

Shere Ali (*shēr ä'lē*), emir of Afghanistan (1863-79), was born in 1825 and died in Russian Turkestan, February, 1879. He had many vicissitudes as a ruler, from the rivalry of those who aspired to the Afghan throne and from the intrigues of Russia, which sought to bring Afghanistan (or Afghan Turkestan) within the sphere of Russian influence. Shere Ali welcomed a political mission from Russia, but declined to receive an English embassy; this aroused the fear of England for its Indian frontiers. Negotiations were fruitless, and the English, pushing forward, occupied Jelalabad and Kandahar. Shere Ali fled to Russian territory, but Yakub, his son, in 1879 proclaimed emir, resisted the further advance of the British; but peace was declared at Gandamak on condition of the emir receiving a British resident at Kabul. This resident was treacherously slain, however, and a religious war was proclaimed. Kandahar now was garrisoned by British troops, and to relieve them Roberts (see ROBERTS, LORD) made his famous march to Kandahar, routed the Afghans, and installed Abdur Rahman (who died in Oct. of 1901) on the throne. See AFGHANISTAN and INDIA.

Sher'idan, Philip Henry, American general, was born at Albany, N. Y., March 6, 1831, his parents having arrived from Ireland a few weeks previous to his birth. Soon after his birth the family removed to Ohio, where his boyhood was spent. He was appointed a cadet at West Point, where he graduated in 1853 and was assigned to the 3d infantry as brevet second-lieutenant. When the Civil War broke out, he was a captain in the 13th infantry and was made quartermaster of the Federal army in Missouri. Seeking more active service he was assigned as colonel of the 2d Michigan cavalry, where he soon displayed the qualities which later won worldwide fame. He was soon placed in command of a brigade and then of a division of the army of Ohio. He took part in the battle of Perryville, and won promotion to major-general by his brilliant service in the bloody battle of Stone River on Jan. 2 and 3, 1863, where his division lost over 1,600 men. He also distinguished himself at Missionary Ridge. When Grant was placed at the head of all the armies, he gave Sheridan command of the cavalry of the army of the Potomac. Here he soon distinguished himself in the Wilderness campaign by his celebrated raid around the Confederate army, cutting their lines of communication, advancing nearly to Richmond, and defeating the Confederate cavalry at Yellow Tavern under Stuart (*q. v.*), their renowned leader, who was killed in the fight. In July, when a strong Confederate force under Early had defeated the Federal army in the Shenandoah Valley, penetrating into Maryland and threatening Washington, Grant saw the necessity of putting that department in the hands of an able general, and in August he placed Sheridan in command in the Shenandoah, with instructions to drive the Confederates out of the valley. Sheridan attacked Early at Winchester and again at Fisher's Hill, defeating him at both points, capturing 5,000 prisoners and many guns, and pursuing them to Stanton. In recognition of this service he was made brigadier-general in the regular army. Early's army, receiving large re-enforcements from Lee, again advanced into the valley, surprised the Federal army at Cedar Creek in the early morning of October 19, and drove them back in confusion. Sheridan, who had been called to headquarters at Washington, had reached Winchester on his return, when

PHILIP H. SHERIDAN

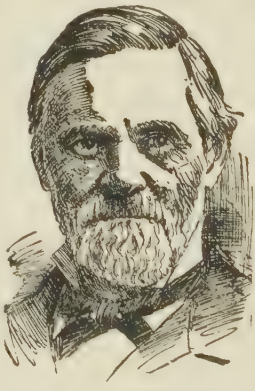
he heard the guns 20 miles away. Hurrying forward, he reached the field and met his troops retreating in confusion before the enemy. Speedily forming a line to stop stragglers, he rode forward waving his hat and shouting: "Face the other way, boys; we are going back." Confidence was restored, the lines were re-formed, and at 3 P. M. they moved back upon the enemy. The result was the total rout of Early's army, which was pursued up the valley for 30 miles. For this victory he was promoted to be major-general in the regular army, and received the thanks of Congress. Returning to the army of the Potomac in March, 1865, he was conspicuous under Grant in the operations before Petersburg and in the final battles preceding Lee's surrender. It was his superior generalship at Five Forks, where he entrapped and routed the Confederate right under Pickett and Johnson, capturing 5,000 prisoners, which compelled the evacuation of Petersburg. After the close of the war Sheridan was placed in command at New Orleans and, later, of the department of the Missouri, with headquarters at Chicago. When Sherman was made general, Sheridan was made lieutenant-general. When Sherman was retired, a special act of Congress conferred the further rank of general upon Sheridan. As a field-commander Sheridan was unapproachable. Filled with the ardor of battle, so that it was said he raged like a lion, his skill equaled his courage. He never lost a battle; and stood, after Grant and Sherman, one of the greatest of northern generals. Grant said : "As a soldier there is no man living greater than Sheridan. He belongs to the very first rank of captains, not only of our army, but of the world. I rank him with Napoleon, Frederick and the great commanders of history." Shortly before his death, at Nonquitt, Mass., Aug. 5, 1888, Sheridan wrote *Personal Memoirs*.

Sheridan, Richard Brinsley Butler, a British dramatist, was born at Dublin, Sept. 30, 1751. He made his first appearance in a farce called *Jupiter*, written in connection with a school-friend. After marriage he settled in London and produced his first and most popular play, *The Rivals*, in 1775. *The School for Scandal* appeared at Drury Lane Theater, of which Sheridan had become owner, and brought prosperity to it by its popularity. He entered Parliament, became undersecretary for foreign affairs in 1782 and secretary to the treasury in 1783. His high reputation as a speaker rests mainly on his three great speeches during the impeachment of Warren Hastings. His first speech produced such an effect in the house of commons that the house decided to adjourn without voting, because they were too much under the influence of the brilliant orator to vote impartially. He was in Parliament 32 years, and was known as a strong speaker, but only equaled this first great speech in a magnificent oration in 1794 on the French Revolution. Drury Lane Theater became too small, and a new one, built in 1794, was burned in 1809, which left Sheridan in great poverty. He died on July 7, 1816, and was buried in Westminster Abbey. See *Life* by Mrs. Oliphant in the English Men of Letters Series and *Sheridan and His Times* by Thomas Moore.

Sher'man, Tex., a city, the capital of Grayson County, in a rich grain, cotton and fruit-producing district in northern Texas, 61 miles north of Dallas. It is well-supplied by railways, and is an important shipping and manufacturing center. Its industries include a large cottonseed-oil mill, cotton-gins, flour and lumber mills, brick-works, a bag-factory, several foundries and machine-shops, brick and marble works, planing-mills, carriage, furniture, broom and mattress factories. Here are Austin College for boys, North Texas Female College, Sherman Institute, St. Joseph (R.C.) Academy and other institutions. Population 14,000.

Sherman, James Schoolcraft, an American politician, was born in Utica, N. Y., Oct. 24, 1855, and graduated from Hamilton College in 1878. He entered on the practice of law in 1880, was elected to Congress by the Republicans in 1886, and, except in 1891–3, has ever since been a member of the House of Representatives. He has been a member of many of its most important committees, and is intimately acquainted with public affairs. In June, 1908, he was nominated by his party for the vice-presidency. His party services have been extensive, but he is more a conservative than a radical Republican, though he is not reactionary.

Sherman, John, an American statesman, brother of General Sherman, was born at Lancaster, O., May 10, 1823. He was admitted to the bar in 1844, and in 1855–61 he was in Congress as a representative from Ohio and chairman of the committee of ways and means during 1860–61. He was elected United States senator in 1861, and continued to serve Ohio in that capacity, except during the presidency of Hayes, when he was secretary of the treasury (1877-81). In the Civil War he raised a regiment in Ohio, largely at his own



JOHN SHERMAN

expense, and, as chairman of the committee on finance in the senate, helped to plan measures for sustaining the public credit. (See SPECIE-PAYMENTS, RESUMPTION OF.) The bill for the reconstruction of the seceded states was the joint work of Thaddeus Stevens and John Sherman. He was appointed secretary of state by President McKinley in 1897, but resigned because of failing health. Of much interest are his *Recollections of Forty Years*. He died on Oct. 22, 1900. See *Life* by Bronson.

Sherman, Roger, an American statesman, was born at Newton, Mass., April 19, 1721. He was a shoemaker by trade, then a surveyor of lands and finally a lawyer and judge. He was in the Continental and in the United States Congress from 1774 to 1791. He was of the committee that drafted the Declaration of Independence, was one of the signers, and was influential in having it ratified by the convention of Connecticut, where he had resided since 1761. He died at New Haven, Conn., July 23, 1793.

Sherman, Wil'liam Tecum'seh, American general, was born at Lancaster, O., Feb. 8, 1820. He was the son of Judge Charles R. Sherman, who died in 1829, leaving his family in rather straitened circumstances. William was brought up in the family of Thomas Ewing of Lancaster, where he attended Lancaster Academy. From there he went to West Point, where he graduated in 1840, sixth in a class of 43. He served as second-lieutenant in the 3d artillery against the Seminole Indians in Florida in 1840 and 1841. After that he was stationed at Ft. Moultrie, South Carolina, until 1846, when he was sent to California, where he served through the Mexican War and until 1850, having been made captain in 1848. In 1850 he married Ellen Boyle Ewing, daughter of Thomas Ewing. In 1853 he resigned his commission and became a partner in the banking-house of Lucas, Turner and Co. of San Francisco. In 1858 he took up the practice of law in Leavenworth, Kan., but next year became superintendent of the Military Academy at Alexandria, La. This position he held until Louisiana seceded in 1861, when he resigned, and, coming north, was appointed colonel of the 13th infantry in June, 1861. He commanded a brigade in the first battle of Bull Run, and for gallantry in this engagement was made brigadier-general of volunteers on Aug. 3. He was next assigned to a command in Kentucky where, finding his small force entirely inadequate to meet the Confederate army under Breckinridge, which confronted him, he earnestly represented the situation to the secretary of war, stating that it would require 60,000 men to expel the Confederates from the Kentucky line and 200,000 to move offensively to the Gulf and clear the Mississippi valley. For this statement he was charged with being "crazy," but subsequent events proved his judgment sound. Sherman was next ordered to Paducah, Ky., and, after the capture of Ft. Donelson, was put in command of the 5th division of Grant's army. In the battle of Shiloh, April 6, 1862, Sherman held the key to the position, and by his brilliant generalship saved the day. He was in the thickest of the fight, had three horses killed under him, and was twice wounded. Grant said: "Sherman, with raw troops, held the key to the Landing, and to his individual efforts I am indebted for the success of the battle." In recognition of this service he was made major-general of volunteers on May 1, 1862. His next important service was in the operations connected with the siege and capture of Vicksburg. In command of the 15th corps he went down the river from Memphis, the plan being that Sherman should attack Vicksburg, while Grant should move on Jackson. But the capture of Grant's supplies at Holly Springs brought him to a halt, and permitted the enemy to re-enforce Vicksburg. In the meantime Sherman advanced on the city, which he assaulted on Dec. 29 but found impregnable to his force. A few days later, in connection with General McClernand, he stormed Arkansas Post, capturing 7,000 prisoners. In the subsequent battles in the campaign against Vicksburg Sherman bore a conspicuous part. When Grant's rear was threatened by Joseph E. Johnston, Sherman was sent against him and captured Jackson, Miss., dispersing Johnston's army. When Grant was sent to succor Rosecrans after the battle of Chickamauga, he called Sherman to his aid and placed him in command of the army of the Tennessee. Here he took part in the battle of Missionary Ridge, where Bragg was defeated and driven into Georgia. He was next sent by Grant to the relief of Burnside, who was besieged by Longstreet at Knoxville. When Grant was called to the head of the army, Sherman was given command of the department of Mississippi and of the three armies of the Ohio, the Cumberland and the Tennessee. On May 5 he began his great campaign against the Confederate army under Johnston, which ended in the capture of At-

GENERAL SHERMAN

lanta and included the battles of Dalton, Resaca, New Hope Church, Kenesaw Mountain and Peach-Tree Creek. After the occupation of Atlanta, the Confederate army under Hood having moved westward, Sherman sent Thomas back to Nashville to confront Hood, while with 65,000 men he began his famous "march to the sea," which was accomplished by the capture of Savannah on Dec. 21. On Feb. 1, 1865, he began his march northward through the Carolinas, closing with the surrender of Johnston's army, April 26, at Durham Station, North Carolina. On May 24, at the head of his magnificent army, which had just completed the march of nearly 2,000 miles in a hostile country, he passed in review before President Johnson, General Grant and thousands of spectators on Pennsylvania Avenue, Washington.

After the war Sherman was appointed to the command of the second military division, with headquarters at St. Louis. When Grant was made general in 1866, Sherman was promoted to be lieutenant-general in the regular army, and, on Grant becoming president in 1869, Sherman was appointed general of the army of the United States. This position he held until, at his own request, Nov. 1, 1883, he was relieved and succeeded by Sheridan. He died at New York, Feb. 14, 1891. Sherman's qualities have, by one well-competent to judge, been summed up thus: "Above all his other excellencies shone his promptitude, celerity and immeasurable activity. What for some commanders were winter-quarters were to him a bivouac. Always ready for the start, indefatigable on the march, omnipresent in battle, relentless in pursuit, Sherman made himself not only more feared but more respected by the enemy than any general in the national armies save, perhaps, the one who commanded them all." In 1875 appeared *Memoirs of General W. T. Sherman by Himself*.

Sher'ry. See WINE.

Sher'wood For'est, a stretch of hilly country in Nottinghamshire, England, about 25 miles long and from six to eight wide. It formerly was a royal forest, and is the scene of many of the exploits of the famous Robin Hood. It is almost entirely cleared now, and occupied by country-seats and parks. See *Nottinghamshire and Sherwood Forest* by White.

Shet'land, a group of islands north of Scotland, forming one of its counties. They number more than 100, 29 being inhabited. There are no trees and only one sixth of the soil is cultivated, but the cliff-scenery is fine and the coast so broken that no spot is more than three miles from the sea. Fisheries form the leading industry. The little, shaggy, Shetland ponies are well-known. Shetland, the *Ultima Thule* of the ancients, belonged to Scandinavia until 1468, and Norse was spoken in Foula in 1774. Area 550 square miles; population 28,166; chief town, Lerwick. See *The Pirate* by Scott and *Orkneys and Shetland* by Tudor.

Shibboleth (*shĭb'bō-lĕth*), a word used by the Gileadites under Jephtha after their victory over the Ephraimites, to test the fugitives at the ford. The Ephraimites could not pronounce the *sh*, but called it *sibboleth*, and so were easily known. The word is still used in the sense of a test.

Shields, South, a town of England, is a seaport in Durham, at the mouth of the Tyne, nine miles northeast of Newcastle-upon-Tyne. The coast is fine, with picturesque caves hollowed out in the cliffs. The south pier, a gigantic breakwater 5,218 feet long, was begun in 1854. The harbor is lined with ships and boat-yards, iron, glass, alkali and rope works and paint and varnish factories. The Tyne docks also, which cover 50 acres, are near the town. The first lifeboat (*q. v.*) was built at South Shields and used first in 1790. The town was a military station in the time of the Romans; salt-works were established as early as 1489 and glass-works in 1619. Population 111,400.

Shill'aber, Benjamin Penhallow, American humorist, known by his pen-name of Mrs. Partington, was born at Portsmouth, N. H., July 12, 1814, and died at Chelsea, Mass., Nov. 25, 1890. Taking early in life to a printing-office, he advanced to journalism, and successively was editor of the Boston *Post*, the *Saturday Evening Gazette* and of a comic journal, *The Carpet-Bag*, to which John G. Saxe was a contributor. In 1854 he published *Life and Sayings of Mrs. Partington*, which gave him a wide reputation. This was followed by many humorous writings.

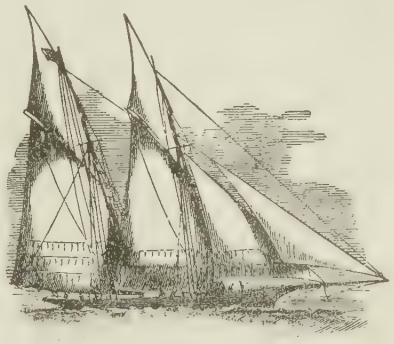
Shi'loh, a town of Ephraim, the home of Eli and Samuel and the religious center of Israel for many years. The site is occupied by a ruinous village, 20 miles northeast of Jerusalem.

Shiloh, Battle of, one of the most desperate battles of the Civil War, named for a log meetinghouse two miles from Pittsburg Landing on Tennessee River. The battle between the Confederates under Johnston and the Federal army under Grant lasted two days. On the first the Federals were driven steadily back, but regained the lost ground on the next day, when re-enforced by Buell's command. Johnston was killed and the Confederates retreated, with nearly equal losses on both sides. The battle began on Sunday, April 6, 1862, and is sometimes called the battle of Pittsburg Landing.

Shin'toism. See JAPAN.

Ship, the name given to most sea-going vessels, but usually applied to sailing-vessels, those moved by steam being called steamers. The art of building vessels that

could be moved on water is very ancient, beginning probably with the simplest forms, as the canoe and raft, though Noah's ark was more elaborate and, what is remarkable, its proportions are those still considered the best for all purposes by shipbuilders. It was six times longer than its width, and three fifths of its breadth deep. The nations living around the Mediterranean early learned the art of sailing on the ocean, building wooden vessels moved by oars, as galleys and triremes, and using sails. Their ships in a storm were often bound outside with heavy ropes or even with iron bands carried for the purpose, as the ship in Paul's voyage had to be "undergirded." The Scandinavians were early known as fearless sailors, and their warships were made stronger than the galleys used on the Mediterranean, as they had a fiercer ocean to sail. The English navy was first made of importance by Alfred the Great, who introduced galleys with 40 or 60 oars to defend the coasts against the northern vikings. The crusades made necessary still larger ships and the use of sails, and the *Great Harry*, built by Henry VIII, is considered to be the first ship of the present English fleet. Spain, Portugal, Venice and the Netherlands had large navies in the 15th century. The adventurous spirit which led to the discovery of America and the passage around the Cape of Good Hope increased the demand for improved sailing-vessels, and France, Spain, Sweden and Denmark were noted for their ships. The first ship built in the United States was the *Virginia*, at the mouth of Kennebec River, in 1607, and shipbuilding soon became quite an industry in New England seaports. Their ships were original in plan, and built for special purpose, as frigates for war-vessels, schooners and sloops for coast service, whalers for the whale-fishery and the "clippers" for the China and India trade. The clipper-ship, the *Great Republic*, was the largest merchant-vessel ever built, and many of them equaled in speed the steamships of the period. A ship, strictly speaking, has at least three masts with square sails. Brigs are smaller than ships, having two masts with square sails. Schooners have two or three masts with a variety of sails; and a sloop has only one mast. The cutter is a form of the schooner, and the barkentine is a combination of the ship and the schooner. The introduction of iron and steel into shipbuilding and the use of steam have changed the mode of building and the size and form of ships, though there is a tendency of late years to revert to



SCHOONER

sailing-vessels. England has been the great shipbuilding country, but Germany, France, Italy and America are increasing their production largely. See GALLEY, NAVY, SAILS, SHIPBUILDING, STEAMSHIP, TRIREME and YACHT. See *Shipbuilding Industry of the United States* by Hall and *Modern Shipbuilding and the Men Engaged in It* by Pollock.

SAILS OF A FULL-RIGGED SHIP

Ship'build'ing. By ship we mean a seaworthy vessel, as distinguished both from boats and from airships. A true ship became possible when man thought of making a strong frame on which a large number of separate pieces of wood might be placed. This gave size as well as strength. The essential parts of this frame are the keel underneath, the stem and stern posts, upright at either end, and the ribs between, on which the sides may be fastened. The Chinese, the Phœnicians, Greeks and Romans

were the great builders of ancient ships. Their progress was chiefly in the direction of building galleys, vessels propelled by oars, in which the rowers commonly sat in two or three decks, one above the other. The rowers' benches gave strength to the structure. A ship 140 feet long and 18 feet wide was considered very large. The vikings of northern Europe had still smaller vessels, in which, however they made more adventurous voyages, sailing to Iceland, Greenland and North America. In 1880 there was unearthed from a burial-mound a viking warship, buried perhaps nine centuries before. It was only 78 feet long and seven wide; its depth was 5¼ feet. The mast was 40 feet high, and it seems to have had one great, square sail. There was no deck. During the middle ages the largest and most formidable warships and the most valued merchant-vessels were galleys, which seldom ventured on oceanic voyages. By 1500 larger vessels began to be built, and in 1511 we find that Scotland built *The Great Michael*, 240 feet long and perhaps 50 wide. *The Santa Maria*, in which Columbus sailed across the Atlantic, was 90 feet long and 29 wide. The great proportionate width, when compared with the viking vessel, is noteworthy. In the 17th century, largely stimulated by the necessity of ocean-voyages to America and the Indies and by naval warfare, much more attention was paid to methods of strengthening the frame. In consequence by 1800 there were built vessels of three decks, strong enough to stand the pressure of the tremendous sail-spread that is familiar to us from pictures. By the same time the custom of building ships with very high decks fore and aft, with only a low deck in the center, had disappeared. Galleys, also, had by this time disappeared, except for a few special purposes. England had for a time fallen behind the continent, but at this date we find her stepping to the front of shipbuilding nations. Most remarkable, however, is the prominence of the New England colonies and states. Salem and other ports were active in this line of industry by 1650, though 300 tons was probably the largest size then attempted. By 1800, however, the industry was firmly established, and in the War of 1812 it was the superior construction and design of the American vessels which contributed not a little to the success they enjoyed. American vessels then gained and still retain the first place for speed. In 1862 *The Dreadnought*, an American built "clipper" ship, sailed from Sandy Hook to Queenstown in 9 days and 17 hours, which is the record still for sailing-vessels.

As early as 1701 Denis Papin had experimented with a paddle-wheel steamboat on Fulda River in Germany, Fitch of Connecticut had in 1785 constructed a steamboat, and in 1802 Symington made a steamboat which towed vessels upon the Clyde in Scotland. In 1807 Robert Fulton built *The Clermont*, which for many years carried passengers on the Hudson. In 1819 *The Savannah*, built in New York, crossed the Atlantic, using paddle-wheels in calm weather to supplement her sails. In 1833 *The Royal William*, built in Quebec, *steamed* across the Atlantic in 22 days. All these vessels were wooden, and combined steam and sail power. American shipyards held their own until iron-vessels were introduced, when British yards rapidly took the business from us, and the ownership of the vessels followed in the same direction. In 1821 the first iron-vessel, a steam canal-boat, *The Aaron Manby*, was built in England. In 1837 the screw-propeller, as invented by Ericsson, took the place of the paddle-wheel for the first time, and rapidly gained in favor. In 1845 *The Great Britain*, an iron screw-steamer, crossed the Atlantic. It was 322 feet long, with a tonnage of 3,270, and was the first vessel of the type of the modern ocean-liner. In 1858 *The Great Eastern*, 680 feet long, of 18,918 tons and of 14 knots' speed, with a combination of paddle-wheel and screw propulsion, set a mark for size which was not equalled till 1901. *The Celtic*, built in that year, exceeded 20,000 tons.

The Alaska, built in 1882, of 6,400 tons, steamed from Queenstown to Sandy Hook in less than seven days; in 1889 *The City of Paris* (10,669 tons) reduced this time to less than six days; and in 1907 *The Lusitania*, soon followed by a sister-ship, easily and regularly completed the passage in much less than five days. There are about 22 ocean-liners that regularly exceed 20 knots an hour on their voyages. Of these England owns nine, Germany five and the United States and France four each. Of about 200 ocean merchant-steamers that exceed 16 knots England owns 100 and the United States 40. The United States also has large, swift steamers on the Great Lakes and magnificent paddle-wheel steamers that sail the Hudson, Long Island Sound and other comparatively smooth waters.

Excepting those of Japan and a few other nations of much less importance, there are in the world about 31,000 ships of more than 100 tons, with a total tonnage of nearly 40,000,000 tons. Of this total about 32 million tons are steam-vessels, and of the steam-vessels about 27 million tons are steel and about 5,000,000 iron tonnage. Of the sailing-tonnage about four and a half millions or more than half are of steel or iron. In 1908 Britain had 17,499,542 tons of the world's steamers, Germany 3,839,378 and the United States 3,549,461.

Of all steamers Great Britain owns a little more than half, Germany about one

ninth and the United States about one eleventh. Of our steamers about half are built in ocean-ports for ocean-trade, and about one half in lake ports for lake-shipping. Of all sailing-vessels England owns about one fourth, the United States about one fourth and Norway one eighth. There are few large sailing-vessels on the American lakes. The average size of steamers is about 1,600 tons; of sailing-vessels 580 tons. The average size of vessels has increased three and a half times in the last 30 years. Steam-vessels are constantly taking the place of sailing-ships, and steel-ships of iron and wooden ones.

The United Kingdom builds about 1,600,000 tons each year, including war-ships. This total is about two thirds of all the tonnage produced. The United States builds about 400,000, Germany about 300,000, and France about 100,000 each year. Of the states in the Union, in iron and steel shipbuilding Pennsylvania easily leads, with New York, Maryland and Michigan following. In building wooden ships, a much less important industry, New York leads, with Maine, New Jersey, California and Washington following. In 1905 the value of the products of shipbuilding plants in the United States was $82,769,239, to which should be added $17,265,469 as the value of the product of the Federal government's establishments.

As regards material, the advantage of steel and iron over wood is, first, in *weight;* iron saves 30 to 40% in weight compared with wood, and steel nearly 15% compared with iron. Second, as regards safety, steel-ships are far safer than iron or wooden ships, largely because injuries from collisions etc. do not spread so extensively. As regards convenience in manufacture, steel is easier to work when cold than iron, and can be cast or rolled in larger sizes, for many parts of the ship. Both these materials enable a machine to manufacture and substitute *one* piece in many portions of the ship, where, in a wooden vessel, the carpenter must carefully fit together many pieces. The single disadvantage of the metal ship is its greater tendency to become covered with sea weed etc.— that is, to "foul." In consequence it must resort much more often to the docks for cleaning.

Shipbuilding once was a trade and an art. It now is an *industry* in which many trades are combined, from boiler-making to electric-wiring and from the calculation of the strains to which the several parts will be submitted to the decoration of the splendid furniture of the finished ocean-liner. Again, it is a *science* rather than an art, inasmuch as the builder is guided, not so much by the image and the actual sight of the ship, as by a system of rules and by pages of calculations.

The best ships are built double-bottomed. The keel is laid, and then the bottom is built of a number of cells or steel-boxes. One or more longitudinal bulkheads run the length of the ship. Steel frames take the place of the old wooden ribs, and are so shaped as to connect readily with the other parts of the ship. Plates of the required sizes and shapes are then brought, riveted and calked. The rivets are brought red-hot, placed through holes bored in the plates, and then hammered out so as to stay. As they cool, their grip fastens. Calking is done by hammering a chisel-shaped tool against one plate where it overlaps the next one. The great length of our modern ships is made possible by a truss-construction, not unlike that employed in many steel-bridges. The best ships are divided into many watertight compartments, such that two or more may be filled without causing the ship to sink. These compartments naturally add still more to the strength of the ship. It is common to use the double-bottom to admit water as ballast, where the ship has a light cargo. In simpler ships the frame or rib joins directly to the keel.

Vessels are usually launched when the hull is sufficiently advanced to assure its floating, so as to diminish the weight to be handled in launching. A cradle is commonly built around the ship, which is of wood, and rests on smooth, wooden "ways" which are lubricated with soap etc. These support the vessel beneath and at the sides. The keel rests on blocks, which also support the ship out towards the sides. When these blocks are knocked away, the weight of the ship is transferred to the cradle and to the ways. As these have a slope of about five eighths of an inch to a foot and are well-greased, the ship has only to be released from restraint to start with increasing velocity towards the water. It is at the moment when the restraints have been removed, after the blocks have been knocked away that the ceremony of "christening" the ship commonly takes place. Once the vessel is afloat, the machinery and, if it is a warship, the armament are put in, and the furnishings of the ship are completed. In the case of a modern ocean-liner the rooms are decorated as in the richest hotels.

Many enormous cargo-ships have been built, of which *The Oceanic* of 28,000 tons is the largest These ships have steam or electrical hoisting-engines on their decks, and the masts serve as derricks in port and as signal-posts at sea. Sails they never bear. Oil is shipped in tank-steamers, and wheat-ships have special forms of construction to make the unloading and loading easier.

Most large vessels are now built with two and even more screws. This enables the

ship to proceed if one shaft breaks and also to steer with the screws if the steering-gear is broken. The latest improvement in propelling is the use of turbine-engines. In the regular engine there is a backward-and-forward motion of the crank of the engine, which is called a reciprocating engine. In the turbine the steam enters a huge, hollow wheel, and, striking many obstructions in it, imparts a rotary or circular motion to the wheel before it leaves the wheel. The motion of the wheel is so swift that it is not economical to use turbines on any but the faster vessels. A disadvantage of their use is that no way has been found to reverse the turbine, for a ship sometimes has great need to reverse quickly in order to avoid collisions etc. Turbines are now employed in many European vessels, but are not yet in common use in America.

Two turbine vessels, *The Lusitania* and *The Mauretania* of the Cunard line, are in a class by themselves, and mark the present limit of steamship construction. The former is 790 feet long, 88 broad, 60½ deep, with a draft of 33½ feet. Her tonnage is 45,000 and her horsepower 70,000. Her maximum speed is about 26½ knots, or about 30 miles, an hour. She has six turbines, four to drive the ship ahead and two to reverse her motion in case of need. The rest of the time these lie idle. She therefore has four propellers at the stern. The reverse engines are prepared to apply their power to the two middle ones. The boat is equipped with elevators, and has broad promenades. Her size makes her steady in rough weather. She is fitted in a most elaborate way, to give every comfort and luxury that it is likely that her passengers will think of. Her crew is 800 men, and she carries 2,200 passengers of various classes. *The Mauretania* is the same size, but apparently a little slower. The ships are fitted with platforms for 12 six-inch guns, and in time of war can be converted readily into cruisers for Great Britain. See NAVY, SHIP, STEAMSHIP and TURBINE.

Shi'ras, George, American jurist and associate-justice of the United States supreme court, was born at Pittsburgh, Pa., Jan. 26, 1832, and educated at Ohio University, Athens, O. He subsequently graduated at Yale, studied law there, and was admitted to the bar in his native city, where he practiced with success until 1892, when he was appointed to succeed Judge Bradley as associate-justice of the supreme court.

Shiraz (*shē'räz*), a city of Persia, celebrated in Persian poetry for its climate, wine, roses and beautiful gardens, is on a broad plain, 35 miles southwest of ancient Persepolis and 217 southeast of Ispahan. The walls are about four miles around, and there were many fine mosques and other buildings until the earthquakes of 1812 and 1824, which destroyed large parts of the city and 4,000 of its inhabitants. An earthquake in 1853 completed the destruction of the city and killed 10,000 people. The city has been rebuilt, and its wine, which resembles Tokay, is still famous. Rosewater is made in large quantities, and very fine inlaid work is produced. The city was a favorite resort of the Persian princes and was the home of Hafiz and Sádi, the poets, whose tombs are in the neighborhood. Population 50,000.

Shishak (*shī'shăk*), the name of several kings of Egypt belonging to the 22d or Bubastite dynasty (10th century B. C.). The name of Shishak or Sheshonk I is found on the porch of the great temple of Karnak and on several statues of a goddess, which probably came from Luxor. Jereboam, it is recorded in *Kings*, fled to Shishak when Solomon wished to kill him, and on his return became king of the new kingdom of Israel, which was formed by the ten tribes revolting from Rehoboam. Shishak marched against Rehoboam in the fifth year of his reign, and took Jerusalem and the treasures of the temple. This conquest of Jerusalem is recorded on the monuments of Karnak, where Shishak is represented as dragging before his god, Ammon, three rows of prisoners, marked with the names of such places as Judæa, Megiddo and Ajalon.

Shoe'mak'ing is an industry which probably was introduced into the United States by Thomas Beard on the third voyage of *The Mayflower*. Shoes were made entirely by hand until the introduction of a nailing and lasting machine by M. J. Brunel, an Englishman, in 1810. By 1850 the parts of shoemaking had become divided among sets of workmen, so that one set did the cutting, another the sewing, and yet another the lasting, pegging and trimming. But in 1850 the leather began to be rolled by machinery; and in 1860 the McKay sewing-machine was introduced for sewing together the soles and the uppers. At present the fastening is done by means of a welt, a strip of leather sown to the upper and bent over the sole of the shoe. The making of shoes at present calls for little hand-work, except that in the case of the best soles the leather is often cut for the uppers by hand for the sake of ensuring the flawlessness and uniformity of the piece. The leather is pared by a machine, rolled solid by a machine, often cut by a machine, stitched by a sewing-machine (often by several, one for each seam), and often lasted, soled and heeled by a machine. The soles of course are always cut separately from the uppers; and the heels are usually cut and built up separately by a machine before they are fastened to the

shoe. Finally a machine is used for trimming and polishing. In the United States about $120,000,000 is invested in the manufacture of shoes; and the annual output is probably worth $300,000,000. Yet these figures represent only about 1,600 great shoe-factories.

Shoot. In the higher plants the main axis of the body grows in two directions. In general, that part of it which grows downward is the root and that which grows upward is the shoot. In ferns and seed-plants the shoot for the most part is differentiated into stem (often with branches) and leaves. In ordinary liverworts (as *Marchantia*) and in the sporophyte of mosses the shoot is not so differentiated.

Short'hand or **Phonog'raphy** is a mode of writing which has been invented to enable one to write as rapidly as a man can speak. The first system appeared in 1588, and nearly 200 different systems have been published. The first system used a set of marks for words, instead of spelling them out with the letters of the alphabet. In 1602 appeared the *Art of Short Writing by Spelling Characterie*, by John Willis, which used signs for the letters. Isaac Pitman's system, called phonography, was published in 1837 and is largely used, though some improvements have been made in it. It has been adapted to the Japanese, French, Italian, German, Dutch, Spanish, Hindu and Malagasi languages. It is based on the use of characters to represent the sounds instead of the letters of the English language. The characters used, curves, lines, dashes etc., also stand not only for a sound but for words which occur very frequently, as the, and, it etc., called letter-words or grammalogues. The marks also indicate the vowels by their position on, above or below the line. The great use of shorthand is in reporting speeches. A speaker utters from 60 to 180 words a minute, or an average of 120 a minute. A swift writer can make 180 separate strokes in a minute. By the use of shorthand it takes an average of one and one third strokes to represent a word, so that a reporter can in this way write 200 words a minute. The various other systems now used are all based upon Pitman's. Consult *History of Shorthand* by Pitman and *Shorthand Systems* by Anderson. See PITMAN, ISAAC.

Shoshone (*shō-shō'nē*) **Falls,** a cataract on Snake River in southern Idaho. The river runs through a deep gorge between walls of rock 1,000 feet high. The head of the falls is in the shape of a semicircle, from which the water leaps 210 feet in a sheet 950 feet wide. Niagara falls less than 170 feet. Little Shoshone Falls are two cataracts separated by a great rock, with a fall of 182 feet, about four miles higher up the river.

Shoshones or **Snakes,** a family of American Indians, which includes the Utes, Comanches and several other tribes. They have been known by various names, as Buffalo-Eaters, Sheep-Eaters and White Knives. They were found by Lewis and Clark beyond the Rocky Mountains in 1805. Their homes were in the valleys of Snake River, Humboldt River and Great Salt Lake. They have usually been peaceful, having little intercourse with the whites. From 1849 to 1862 there were battles and skirmishes with the advancing settlers, treaties made and broken by the government, until in 1867 they made peace at Fort Bridger and were settled on reservations in Idaho, Wyoming, Nevada and Utah. They number about 6,000.

Shot is the name given to all solid projectiles, *i. e.*, anything thrown out or fired from any kind of firearms. The shot used for cannon and machine-guns are made of cast iron or steel and formerly were solid balls. Balls weighing more than three pounds are not now made solid. Bar-shot were two discs of iron joined by a bar, used to destroy the rigging of a ship; chain-shot, used in the same way, were two round shot fastened together by a chain. Canister or case-shot is a tin cylinder filled with bullets. Grape-shot was a number of small, iron balls held together by canvas or iron plates, but is no longer used. Small shot, used in hunting, is made of lead in various sizes, from that of large peas to dust-shot. The melted lead is dropped from a height through a colander into water. The lead falls in small drops through the holes of the colander, the shot varying with the size of the holes. The fall through the air cools and hardens the lead before it falls into the water. Shot-towers are from 100 feet to 150 feet high; the highest shot-tower is in Austria and is 249 feet high. The shot is sifted in sieves to separate the different sizes, imperfect ones being discovered by rolling them down an inclined plank, and is finally polished. See CANNON, PROJECTILES and SHELL.

Shotgun. A light, smooth-bored gun for sporting purposes, in contradistinction from the military rifle. It is especially designed for firing a number of small shot at short range to kill small game. Shotguns formerly were double-barreled, but now more commonly obtain rapid fire by means of a revolving cylinder or other device. The present perfection in the mechanism and efficiency of the shotgun is due to many inventions in France, England and America. For a long time the best were of English manufacture, but it is now generally conceded that the American weapons have preëminence. See ARMS, GUN and RIFLE.

Showers of Fishes, a curious phenomenon most common in tropical regions. It is explained by a strong draft upward in

the center of a whirling column of air, which sucks up the fish from the water and carries them through the air, dropping them at some distance from their homes. On the Isle of Mull herrings fell on a hill 1,500 feet from the sea and 500 feet above it. Sometimes the fishes are alive, but more often they are dead. Showers of frogs and of dead flies have also been noted.

Shreve'port, La., a town, is the center of a region rich in cotton and cattle. Its chief trade is in cattle, sheep, wool, hides and cotton. Shreveport is on Red River and numerous railroads, — the Texas Pacific, the Houston and Shreveport, the St. Louis Southwestern, the Queen and Crescent and the Texarkana and Fort Smith. A large wholesale trade for the surrounding district centers at Shreveport, especially in groceries and dry goods. The town dates settlement from 1833, incorporation from 1839. Population 20,000.

Shrew, an insect-eating animal having the general appearance of a mouse, but belonging to quite a different order. The mice are gnawers, the shrews are insect-eaters and related to the moles. They have a sharp, pointed snout and jaws with numerous, sharp teeth. The eyes and ears are minute. They come out occasionally from their burrows, but seem very helpless above ground, and are exceedingly shy. They feed both day and night. They do not burrow deeply, their holes being under roots and in logs. They inhabit the Old and New Worlds, living in fields and open woods. Besides insects they eat worms and mollusks. Water-shrews exist also in North America and in Europe.

COMMON SHREW

Shrike, a song-bird found in all parts of the world except South America. Shrikes, besides eating insects, prey upon field-mice and small birds, capturing them with their bills and not with their talons. Owing to the weakness of their feet, their prey is impaled on thorns, and this habit has gained for shrikes the name of butcher-birds. There are about 200 species, but only two in the United States. The great northern shrike, which is a winter visitor, is a little above ten inches long, gray above with a black and white tail and whitish undersurface with black bars. It nests in the arctic circle, but is seen from October to April as far south as Virginia. The loggerhead shrike is common in the Mississippi valley, central New York, Vermont and Maine. It is about nine inches long and colored like the great northern shrike, except that there are no black bars on the breast. Its song is rather unmusical.

SHRIKE

Shrimp, small, slender and long-tailed crustacea inhabiting salt water. The prawns are closely related and are commonly served in shrimp-salad. These animals are all small, in general form resembling a lobster or crayfish. Some are nearly transparent. They live on the sand in salt water. They are taken in great numbers for food, especially in England and in France.

SHRIMP

Siam (*sī-ăm'*), **Gulf of,** an arm of the China Sea, south of Siam and west of Cochin-China. It is 245 miles wide at its entrance, and extends inland for 390 miles.

Siam, Kingdom of, in the Indo-Chinese peninsula, is a country whose limits have varied much at different periods of its history, most of the border-lands being occupied by tribes more or less independent. By the treaty of September, 1893, Mekong River was made the boundary between Siam and the French possessions; but in January, 1896, the British and French governments came to an agreement by which France appropriated the territory of 100,000 square miles lying between the Mekong and the Anam hills, thus leaving to Siam a territory of 220,000 square miles. Negotiations have been in progress recently for a new British-Siamese treaty, which will modify British extraterritorial rights in Siam and cede the Siamese tributary states of Kelartan and Tringaur to Great Britain.

Surface and Drainage. The plain of the Menam valley and the Korat tableland, from 400 to 1,000 feet high, form the larger part of the country. The Menam, 600 miles long, is the principal river, but the bar at its mouth prevents ships of more than 13 feet draught from ascending to Bangkok. Mekhong or Cambodia River

is partly within the territory, but is of little use for navigation, being obstructed by falls and rapids. Many canals have been cut, for transportation has been almost entirely by water.

Natural Resources. Gold has been found from the earliest ages, and the mines are now worked by European speculators; copper, tin, iron, rubies and sapphires are also found. Much of upper Siam is a dense forest, including such woods as mangosteen, teak, rosewood, palms, aloes, sappan and other varieties. The fisheries also are quite extensive, and birds of brilliant plumage and sweet song abound. The animals are those of the tropical regions, the elephant being tamed and used for labor in the teak forests. Some of the famous white elephants are kept in the royal courtyard at Bangkok, but are not held sacred or fed on golden dishes, as the stories assert. The climate is healthy, with two seasons, the wet and the dry, and a rainfall of 54 inches. April is the hottest month of the year.

People and Culture. The population numbers 6,686,846, about one third of whom are pure Siamese. There are 3,500,000 Chinese, besides Burmese, Malays, Cambodians and the Laos or Shans. The Siamese are small, well-shaped, olive-colored, black-haired. They are peaceful, vain, social and lazy, fond of bright colors and jewelry. The children's heads are shaved, except a tuft on the crown, which is cut off with great ceremony when they are grown. Their houses are built of wood thatched with palm leaves, and stand on piles. The banks of the rivers are often lined with wooden houses floating on rafts or bundles of bamboo. The food mainly is rice, fish and fruit. A liquor made from rice is used as a drink, but there is very little drunkenness. Betelnut-chewing and tobacco-smoking are almost universal, the teeth being colored black by the nut and other materials used for the purpose. The religion is Buddhism, and all the Siamese enter the priesthood for a time. The temples are numerous, with gilded minarets, roofs of colored tiles and quaint pagodas.

Production and Industries. Large tracts of waste land, sufficient to accommodate 250,000 people, have been opened by irrigation. One irrigation-company has connected Menam and Bangkapong Rivers and is building numerous smaller canals. Chinese coolies perform the chief part of the labor in field, mill and mine, while forest-labor is done by Burmese, Karens and Khamus. The chief product is rice, with tobacco, coffee, hemp, cotton and tropical fruits. There are 26 large rice-mills and a number of smaller ones. Other products include salt, pepper, dried fish and cattle. Rubber is collected and exported. Teak-cutting also is an important industry, but it is almost entirely in the hands of the British. Manufactures are not developed; only coarse cloth and silk, rough paper and water-jars and tiles are made.

Government. Siam is governed by a king, the present ruler being Chulalongkorn I, who succeeded in 1868. He is anxious to improve his country, and is interested in the introduction of railroads and telegraph lines. Through his influence Siam joined the postal union in 1885, and has an electric-light company to light the streets of Bangkok, which also has electric cars, while education is making distinct progress. In the capital alone there are nearly 80 government and aided schools, and these, with the schools in the provinces, are under the control of an English chief-inspector. There are two training-schools for teachers, one medical college and sericultural and railway schools. The government has spent $5,000,000 on 400 miles of railway construction, telegraph lines have been completed 2,900 miles, and mail-service down the Malay Peninsula has been developed extensively.

History. Siamese history begins with 1350. Cambodia was conquered and made tributary in 1532, and the present dynasty was founded in 1782. Ayuthia was the capital until it was burnt by the Burmese after a siege of two years in 1768. Bangkok (population about 500,000) was made the capital by Phya Tak, who drove the Burmese from the country and became king. Consult Coit's *Siam*; Hallett's *Thousand Miles on an Elephant;* and Vincent's *Land of the White Elephant.* See ANAM, CAMBODIA, COCHIN-CHINA, INDO-CHINA, LAOS and SHANS.

Si'amese' Twins, the name of two children, Eng and Chang, born in Siam in 1811. They were united by a band of flesh growing from chest to chest. They were shown as curiosities in the principal cities of Europe and America, and finally settled in North Carolina, where they married two sisters. The Civil War ruined them financially, and they again made the tour of Europe, exhibiting themselves in 1869. They died in North Carolina, two hours and a half apart, Jan. 17, 1874.

Siberia (*sī-bē'rĭ-a*), a vast territory belonging to Russia in northern Asia. It covers 4,786,730 square miles, stretching from the Chinese empire to the Arctic Ocean.

Surface. A large part is only imperfectly known. It is covered with a network of highlands and mountain-ridges, of which the Great Altai and Sayan Mountains, separating Siberia from Mongolia; the Barguzin and South Muya ridges, with others still unnamed; and the Stanovoi Mountains, which form a high wall on the coast of the Sea of Okhotsk, are the most

important. Some of the peaks of the Altai Mountains and a few others rise into the region of perpetual snow. A belt of forests on the northwestern border of the central plain and, beyond that, another belt of high plains 500 miles wide, 1,700 to 2,500 feet high and most of it very fertile, end in an immense lowland stretching to the shores of the Arctic Ocean. These lands in western Siberia are very fertile, are the granary of Siberia, and contain one third of the population. Between Obi and Irtish Rivers are great marshes, which can be crossed only when frozen; and, farther north still, come the *tundras* (salt prairies and frozen swamps), where the ground is frozen hundreds of feet deep and thaws only on its surface in the summer. Trees disappear, only a few low bushes and a few flowering plants surviving the cold. Yet 50,000 human beings call this region home, and wander over it with sledges drawn by reindeer and dogs. In southeastern Siberia, in the Amur province, are high plains, covered with oak forests and rapidly filling with emigrants from Russia; while there are fertile tracts on the frontier of Korea and a splendid harbor at Vladivostok on Peter the Great Gulf.

Drainage and Climate. Great rivers — the Obi, Yenisei, Irtish, Lena and Amur, being some of them — greatly assist internal communication in this great country, and four lines of railroad have already entered Siberia on the west, one of which, the trans-Siberian line (*q. v.*) opened in 1899, established uninterrupted steam-communication through the Russian empire. Siberia is the coldest country in the world. Yet the summers are much warmer than is usually supposed; melons grow in the open air in some parts, and barley sown in May will ripen by August. The summers, however, are short, and by November all the rivers are frozen, and in the extreme north the thermometer has recorded 75° below zero. The air is very dry and there is no wind, which makes the cold more endurable.

Inhabitants. Siberia has a population of 6,740,600 according to Russian statistics, and racial statistics give 5,578,822. These figures include native Siberians, Koreans, Manchurians, Chinese and about 90,000 Russian immigrants each year. The Russians belong to the Greek church; the Turkish tribes are Mohammedans; while others are Buddhists.

Natural Resources. Siberia is rich in minerals, but mining is undeveloped; gold, silver, lead, copper and iron are mined, however, in considerable quantities, a profitable trade in timber is carried on, and the coal-mines yield over five million tons annually.

Occupations. The chief occupations are farming and cattle-breeding. In a single year 11 million acres were in meadow-land, 9,773,000 in cereal crops and 171,000 in potatoes. The wheat-crop in 1906 was 35,000,000 bushels; the oat-crop of Asiatic Russia 79,678,000 bushels, the larger part coming from Siberia. The live-stock industry is quite valuable, and horses, cattle, sheep and pigs are raised in considerable numbers. Hunting is profitable for the valuable furs of the sable, ermine, gray and white foxes; and fishing is carried on extensively.

Manufactures. Government factories are operated in some of the larger towns, and porcelain, hardware, leather and earthenware are among the products. Extensive woolen and linen factories are among the industries. In Asiatic Russia there are 8,005 miles of railroad. There are 339 schools, supported in the main by local authorities, with 773 teachers and 43,786 pupils.

History. The earliest inhabitants are by some writers called Yeniseians, who were followed by a race of considerable skill, judging from their relics found in mounds. Turks conquered the country in the 11th century, and were themselves conquered by the Mongols two centuries later. Russians first invaded the region in 1580, by a band of Cossack robbers, followed for two centuries by other bands of Cossacks, traders, hunters, dissenters flying from religious persecution and peasants escaping from serfdom. In the first 80 years the Cossacks had reached the Sea of Okhotsk, but Russia's possession was not acknowledged by China before 1857. Bering Strait was discovered in 1648 by Dejnef, the Cossack, who sailed around the northeastern end of Asia; but, as his discovery was not made known, the honor still belongs to Bering. Consult Lansdell's *Through Siberia;* Kennan's *Tent-Life* and *Siberia and the Exile System;* and Dewindt's *The New Siberia.*

Sibe'rian Railroad. The building of this road was begun in 1891 and was completed in its main features in 11 years, including a branch across Manchuria to Port Arthur and Dalny. It starts from Tchelyabinsk on the eastern slope of the Urals, and extends to Vladivostok on the Pacific, a distance of 4,500 miles, following the fiftieth parallel. This is the main division of the railroad. The great Russian system between St. Petersburg, Port Arthur and Vladivostok measures 6,672 miles. The first work on the real road was done on May 1, 1891. In perfecting the enterprise Russia sent commissioners to the United States to study American railroad-systems; imported Italian workmen who had helped to build the Simplon and St. Gothard tunnels; built towns in deserts; and transported whole families by the thousands to them for their work. Many serious obstacles had to be overcome far from the base of sup-

plies. Lake Baikal was a great barrier; steamers transported the cars in summer, and ice-breaking steamers were used for a part of the long winter. The line was completed, however, by the building of a 100-mile detour around the southern end of the lake in 1904. The road was built cheaply, with light rails and wooden bridges, but, when formally opened in 1902, had cost $172,525,000. It has proved a good investment, having given an impetus to agriculture and all other business of Siberia. Branches from the main line are projected, chiefly to the northern portion of Asiatic Russia. In 1906, by Russian official statistics, this road carried 162,000,000 pounds of freight and 2,097,000 passengers. Great quantities of wheat and tea are carried, the tea being brought by caravan from China. This line is of great military and political importance. In 1904 Russia dispatched over 300,000 troops over it in 90 days, with enormous quantities of provisions and supplies.

Sibyl (*sĭb'ĭl*), a name given to certain inspired prophetesses in the classic period. Their number varies, but is generally fixed at ten, of whom the most celebrated was the Cumæan, who is mentioned, in the sixth book of the *Æneid* as leading Vergil into the lower world. According to Livy she came from the east to King Tarquin, offering nine books of prophecies but at so enormous a price that he refused to buy. She then destroyed three, and, returning, offered the remaining six at the same price, and was again refused; destroying still another three, she asked as much for the three left, which Tarquin's curiosity finally induced him to buy. They contained advice regarding the religion and government of the Romans, and were carefully guarded in the temple of Jupiter until 83 B. C., when the temple was burned. A new collection was made of about 1,000 lines, gathered from all the cities of Greece, Italy and Asia Minor, which was kept until some time between A. D. 404 and 408, when it was publicly burned. The Sibylline oracles written in Greek, in 14 books containing 4,000 lines, are entirely distinct, being a series of pretended predictions written by Alexandrine Jews and Christians.

Sicil'ian Ves'pers, the name given to the massacre of the French in Sicily, March 30, 1282, the first stroke of the vesper-bell being the signal for slaughter. Charles of Anjou, brother of Louis IX of France, had conquered Naples and Sicily, but was hated by his Sicilian subjects for his cruelty and injustice. The inhabitants of Palermo at that signal rose against their French oppressors, killing men, women and children to the number of 8,000, an example followed throughout the island, where the French were hunted like wild beasts. The 600th anniversary of the Sicilian Vespers was celebrated in 1882. Consult Amari's *War of the Sicilian Vespers*, translated by the earl of Ellesmere.

Sic'ily, the largest island in the Mediterranean, is the most populous and the most fertile. It lies off Italy, separated by the Strait of Messina, two miles wide.

Area and Surface. It covers 9,935 square miles and is shaped like a triangle. Sicily is a plain, 500 to 1,900 feet above the sea, crossed in the northern part by a chain of mountains, the loftiest peak being 6,467 feet high. From the center of the chain a range branches off, going through the heart of the island to the southeast. The lower mountain-slopes are usually covered with groves of oranges and olives, and the plain with fields of wheat. Mt. Etna rises from the vineclad plain of Catania, 10,850 feet, with a base of 400 square miles. The climate is warm except in the mountain-regions.

Natural Resources. Magnificent forests of oak, ilex, beeches, chestnuts and pine are still found, though many have been recklessly destroyed. Dates, figs, almonds, lemons, olives, pomegranates and grapes are very abundant. The wheat of Sicily is one seventh that of all Italy, and the barley one half of the crop of the kingdom. The only mineral product is sulphur, of which there are some 300 mines. Sardine-fisheries employ a large number of persons.

Industry. It manufactures two thirds of the wine of Italy, and exports a large amount of sumac for tanning. Manufactures, however, are few — mainly cement, crockery, gloves, macaroni, soap, some silk, cotton, woolen and linen goods; glass, oil-cloths and leather are produced. Rapid progress is being made in railroad-building, and 500 miles are in operation.

People. The population numbers 3,571,771. The people are devout but superstitious, and three fourths of them cannot read. Elementary education is compulsory, however, for children between six and nine; and, though this law is by no means strictly enforced, school-attendance is steadily increasing.

History. There were early Phœnician settlements, but the real settlers were Greek colonists who founded cities on the eastern and southern coasts from 735 to 579 B. C. The first struggle with Carthage, which ended for 70 years by the great victory at Himera over Hamilcar in 480, was followed by a Phœnician invasion under Hannibal (not the great Hannibal), but Dionysius the Tyrant checked the Carthaginian conquests. In 210 B. C. the island became a Roman province. It was conquered by the Vandals in 440 A. D., ceded to Theodoric, and regained by Belisarius (535). The Saracen occupation, dating from 827, lasted until the Normans took possession in struggles lasting from 1038 to 1090. The Norman,

Roger, Count of Sicily, in 1130 took the title of King of Sicily and Italy. In 1194 the crown went by marriage to the German emperor until 1264, when Pope Urban IV, a Frenchman, gave Sicily to Charles, Count of Anjou. Manfred, the last native ruler, died fighting against the invader, and his son-in-law, Peter of Aragon, continued the contest, ending with the crowning of his son, Frederick, in 1296. The contests of France and Spain for Sicily and Italy continued, and in 1502 Ferdinand of Aragon defeated the French at Mola and became king of Naples and Sicily. The peace of Utrecht (1713) gave Sicily to the duke of Savoy, who in 1720 exchanged it with Charles VI of Austria for Sardinia, but in 1738 Don Carlos of Spain was king of the Two Sicilies. The Bonaparte rule began with the taking of Naples in 1798, lasting until 1808, when Ferdinand IV was allowed to remain king of Sicily, afterwards taking by the treaty of Paris his old kingdom of the Two Sicilies. At last, on May 11, 1860, Garibaldi, with his thousand heroes, took Palermo and entered Naples in triumph, and the people by popular vote joined themselves to the Sardinian kingdom. The chief cities of Sicily are Palermo (population 309,694), Messina (149,778) and Catania (149,295).

THE TWO SICILIES, a kingdom of southern Italy, included Sicily, several smaller islands and the kingdom of Naples. Consult E. A. Freeman's *History of Sicily*; his shorter history in the Story of the Nations Series; and Frances Elliot's *Diary of an Idle Woman*.

Sick'les, Daniel Edgar, an American general, was born at New York, Oct. 20, 1825. In 1847 he was sent to the legislature, and in 1853 went to England as secretary of legation, and in 1856 became a member of Congress. When the Civil War broke out, he was made colonel of a regiment he had raised in New York, and as brigadier-general commanded in the battles of Chickahominy. At Antietam and Fredericksburg he commanded Hooker's division of the 3d corps, and with the rank of major-general served at the head of the 3d corps at the battles of Chancellorsville and Gettysburg. After the war he was commander of the military district of North and South Carolina until 1867, and in 1869 was appointed minister to Spain. In 1892 he was elected to Congress from New York City.

GENERAL SICKLES

Sidd'ons, Sarah (Kemble), the great tragic actress of England, was born at Brecon, Wales, July 5, 1755. Her father was the manager of a small, traveling, theatrical company, and she took part in the performances from earliest childhood, and at 17 married Siddons, a member of the company. Her first appearance at Drury Lane, Dec. 29, 1775, in the character of Portia was a failure, and for six years her acting was confined to the provinces. In 1782 she reappeared in London as Isabella in *The Fatal Marriage*, and was the queen of the English stage from that time until, as Lady Macbeth, she took leave of it, June 29, 1812. She gave public readings from Shakespeare and Milton, and appeared occasionally for charitable objects after leaving the stage. She died at London, June 8, 1831. See *Life*, by Mrs. Kennard, in the Eminent Women Series.

Sid'ney, Sir Philip, an English courtier and writer, was born on Nov. 29, 1554, at Penshurst in Kent. He studied at Oxford, finishing his education, after the fashion of the day, by travel in France, Germany and Italy. Leicester, his uncle, being all-powerful at the court of Elizabeth, Sidney at once began his public life. He was sent as ambassador to Rudolph II of Austria and then to William, Prince of Orange. At first a favorite of the queen, he lost her influence by his defense of his father against her ingratitude and by his opposition to her proposed marriage with the Duke of Anjou. In 1580 he retired from court, living with Lady Pembroke, his sister, where he probably wrote his *Arcadia*. His associations with Spenser and perhaps the circulation of his writings in manuscript had already given him a wide reputation, which was well-sustained by *Arcadia*, written in 1578–80, which appeared in 1590 and for a century retained its great popularity. It is a pastoral romance written in poetical prose. Though not free from the "conceits" of the age, still is well-worth reading. His *Apology for Poetry* (*Defense of Poesy*), written about 1580, displays vast reading, and, while criticising severely the crowd of common versifiers, names as the best English poets Chaucer, Sackville, Surrey and his friend, Spenser. His own poems, *Astrophel and Stella*, a series of 108 sonnets and 11 songs, were inspired by his love for Penelope, a daughter of Lord Essex, and place him near Chaucer. He returned to court, was knighted, and in 1583 received from Elizabeth a grant of 30,000,000 acres in "certain parts of America not yet discovered," and planned to accompany Drake to America. He was ordered, however, to go with Leicester to the Netherlands, where, after a brilliant exploit in a chivalrous conflict, he was fatally wounded under the walls of Zutphen, Oct. 2, 1586. Faint from the loss of blood, he called for a drink, but, seeing a poor soldier carried by, looking longingly at the water, he handed the

cup to him, saying: "Thy necessity is greater than mine." See *Life* by Symonds in the English Men of Letters Series.

Si'don, an ancient city of Phœnicia, on the eastern coast of the Mediterranean, about half-way between Tyre and Beirut. It held the first position among the cities of Phœnicia, so that it sometimes gave its name to the whole region. Its colonies were found throughout the ancient world, and its commerce was very large. Its manufactures of linen, glass, purple dyes and perfumes were sources of great wealth. Even under Assyrian, Chaldean and Persian rule it retained its importance, reaching its highest prosperity under the Persians. An unsuccessful revolt in 351 B. C. involved it in temporary ruin, from which it recovered speedily. In 333 B. C. Alexander the Great conquered it, and it fell in succession into the hands of Syrians, Greeks and Romans, and in the middle ages was taken by crusaders. The present town, called Saida, has 10,500 inhabitants.

Siemens (*sē'mĕnz*), **Ernst Werner von,** a German electrician, was born at Hannover, Dec. 13, 1816. In 1831 he took out his first patent for galvanic silver and gold plating. His work in connection with the telegraphic system of Prussia resulted in the discovery of the powers of gutta-percha in insulating underground and marine cables. He is known as one of the discoverers of the self-acting dynamo. With his brothers he established large houses for the making of electrical apparatus in Berlin, St. Petersburg, London, Vienna, Tiflis and, in 1892, in Chicago. His scientific papers were collected and published in 1881. He was one of the foremost electricians of the day, sharing with his brothers in many inventions. He died at Berlin, Dec. 6, 1892.

Siemens, Sir **William,** the German scientist, was born near Hannover, April 4, 1823. He studied at Göttingen, giving special attention to science. After two visits to England in the interests of his brother's inventions, he made England his home in 1844 and became a British subject in 1859. As manager of the house of Siemens Brothers, he was engaged in constructing telegraph-lines, the steamship *Faraday* being designed by him for cable-laying. He also built electric railroads. The principle of his "regenerative" furnace has been applied in many ways, but especially by himself in the manufacture of steel. He invented a water-meter, a bathometer for measuring ocean-depths, an electrical thermometer and a process of hastening the growth of plants by electric light. In 1874 the royal Albert medal and in 1875 the Bessemer medal were given him in recognition of his inventions. He was president of the three principal telegraphic societies of Great Britain and of the British Association, and in 1883 was knighted. He died at London, Nov. 19, 1883. See *Life* by Pole.

Siena (*sē-ā'nà*), a city of Italy in the center of Tuscany, about 60 miles south of Florence. It is a walled city, with narrow, winding streets. The cathedral, begun in the 13th century, is one of the finest Gothic churches in Italy, with a wonderful eight-sided pulpit, a fine mosaic-floor, a series of frescos of scenes in the life of Pope Pius II and a font with bas-reliefs by Donatello and other sculptors. The church of St. Catherine, the fountain of Fontebranda, celebrated by Dante, the palace and its high tower, the university, founded in 1300, and the Institute of Fine Arts are among the attractions. There are manufactures of silk, cloth and hats and a trade in wine and olive-oil. Siena, a Roman colony, became a free republic at the breaking up of the empire, and was the head of the Ghibelline towns in central Italy, being a rival of Florence. In 1399, to protect themselves from Florence, the Sienese placed themselves under the duke of Milan, and in 1524, to escape the usurpations of the Petrucci family, they became tributary to Emperor Charles V, who afterwards gave Siena to Cosmo de Medici, and it became a part of Tuscany. It is the seat of a university with 31 professors and 231 students. Population 38,665.

Sienkiewicz (*shĕn-kyā'vĭch*), **Henryk,** Polish novelist, was born at Wola Okrzejska, in Lithuania, in 1846, and was educated at the University of Warsaw. Early in his career, having espoused journalism, he devoted himself to literature, and soon won a high position as a novelist and short-story writer. In 1876 he came to the United States, and for a time, in company with Madame Modjeska, his countrywoman, he resided in California, where he designed to establish a Polish colony. In 1880 he wrote *Tartar Slavery*, following this, a few years later, by his masterly novel, *With Fire and Sword.* To this succeeded *The Deluge, Pan Michael, Without Dogma, Children of the Soil, The Knights of the Cross* and *On the Field of Glory* — all remarkable for vigor of characterization, historical truth and power of psychological analysis. In 1895 appeared his masterpiece, *Quo Vadis?* — a tale of the time of Nero (*q. v.*), written with remarkable vigor and powerful effect.

Sierra Leone (*sĭ-ĕr'rà lē-ō'nē*), a British colony on the western coast of Africa, founded in 1807 and southeast of French Guinea. It lies north of Liberia, with 180 miles of coast, and, stretching toward the interior, covers about 4,000 square miles. The name is sometimes confined to the peninsula south of Sierra Leone Inlet, which is 26 miles long, rising to 3,000 feet in Sugar-

Loaf Mountain. The climate is hot and moist, and the lowlands malarious, giving it the name of the White Man's Grave. The people, numbering 76,655, are nearly all negroes, the white population numbering only 350. Agriculture and trading occupy about one fifth of the population, but the resources are not fully developed. Coffee, cocoa, tapioca, ginger, maize and cotton are grown, and there are a little boat-building, mat-making and cloth-weaving. The chief exports are kola-nuts, palm-oil and nuts and rubber; the chief imports, cotton-goods, tobacco and spirits. Freetown, the capital, the most important seaport in West Africa, is a fortified naval depot and a coaling-station. There are a university, founded by the Church Missionary Society, a savings-bank, a lunatic asylum and 65 schools, with an average attendance of 5,583 pupils. Sierra Leone (Lion Mountain) was discovered by Cintra, a Portuguese navigator, in 1462, and named from the heavy thunder roaring on its mountains. Attempts were made to colonize it with freed slaves in 1787 and 1791; the second effort being made under the Sierra Leone Company and supported by the arrival of 1,200 freed slaves from North America. In 1807 it was ceded by the company to the British crown. A railroad from Freetown extends 226 miles to Baiima near the Liberian frontier. Freetown has a telephone system; there are 221 miles of telegraph; and millions of dollars are being spent on railway extension and port works. The Sierra Leone protectorate, inland, covers 30,000 square miles and has nearly 1,000,000 inhabitants.

Sierra Madre (*sē-ĕr'rȧ mȧ'drȧ*), meaning Main Chain, a range of mountains in Mexico, stretching north into Arizona. The name sometimes includes the Cordilleras.

Sierra Morena (*mō-rā'nȧ*), a mountain ridge in the south of Spain, ranging from 2,000 to 5,500 feet in height. It has valuable mines of lead, silver, lignite and quicksilver; and is the scene of many of the incidents in *Don Quixote*.

Sierra Nevada (*nē-vä'dȧ*), Snowy Range, a mountain-range in southern Spain, crossing the province of Granada, about 60 miles long; Mulahacen, 11,600 feet high, is the highest point of the Spanish peninsula.

Sierra Nevada, a range of mountains in California 450 miles long, merging into the Coast Range. Mt. Whitney (14,886), Mt. Shasta (14,440) and Mt. Tyndall (14,386) are the highest peaks. The mountains are covered with forests, and gold and silver are found in large quantities.

Sierra Nevada, the name of two ranges in South America, both thought to be parts of the Andes. The mountains are wooded on the northern slopes, and naked rocks tower 6,300 feet on the southern side. Copper, silver, gold and coal are found. The highest peaks are from 15,000 to 17,500 feet high.

Sieve- (*sĭv*) **Vessels** (in plants), often called sieve-tubes, the peculiar vessels characteristic of the bast or phloem portion of the vascular bundle. They usually are more or less elongated, and the name refers to the fact that their walls contain certain areas, known as sieve-plates, which are perforated by numerous openings, like the lid of a pepper-box. The sieve-vessels are prominently associated with the transfer of food.

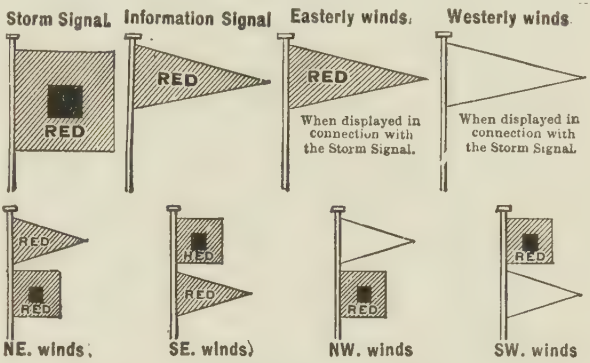
Sieyés (*sē-ȧ'yȧs'*), **Emanuel Joseph,** Count, known as Abbé Sieyès, a prominent figure in the French Revolution, was born at Fréjus, France, May 3, 1748. Entering the church, on account of his health, he became a canon and then chancellor and vicar-general. At the beginning of the struggles for liberty in France he published three pamphlets on political questions which made his name famous throughout France. He was elected a deputy in Paris, and it was on his motion that, when the nobles and clergy refused to join the deputies of the people, they declared themselves the National Assembly. The division of France into departments and the celebrated declaration of the Rights of Man were mainly his work. He voted for the king's death, but was opposed to a republic and to the excesses of the Revolution. Sent to Berlin, he secured the neutrality of Prussia. With Bonaparte he plotted the revolution of the 18th Brumaire (Nov. 9, 1799), ending in the consulate of Sieyès, Bonaparte and Ducos. His new ally, however, proved a master, and he resigned his consulship in disgust, though to propitiate him he was given the title of count, an estate and $120,000. He lived in Belgium during the Restoration, dying at Paris, June 20, 1836. Consult Lamertine's *History of the French Revolution*.

Sigel (*sē'gel*), **Franz,** an American general, was born in Germany in 1824. He was in the service of the grand-duke of Baden, and became minister of war in the Revolution of 1848, but was obliged to flee and came to the United States. He entered the army as colonel in 1861 during the Civil War, and by gallant service rose to the rank of major-general. He was elected registrar of New York City in 1871, and appointed United States pension-agent for the city in 1885. He died on Aug. 21, 1902.

Sigismund (*sĭj'ĭs-mŭnd*), Emperor of the Holy Roman Empire, was born on Feb. 14, 1361. When only 19, he became king of Hungary through his wife. He was terribly defeated in an expedition against the Turks at Nicopolis in 1396. Some years later he conquered Bosnia, Herzegovina and Servia. He became Emperor in 1411. His name is known by his failure to uphold

the safe-conduct he had granted to Hus, and so allowing him to be burned by his enemies. His succession to the throne of Bohemia after his brother's death was opposed by the Hussites, and he only secured it after making concessions a year before his death, which took place on Dec. 9, 1437.

Sig'naling, any means of sending intelligence to a distance by sight or sound. The earliest signals in war were by means of torches and beacon-lights. Ships depend upon a system of flags, varying in arrangement, color and shape. What is known as *The International Code of Signals*, prepared in 1857, has been adopted by nearly all nations. It uses 18 flags, with which 78,000 different signals can be given, using no more than four flags at a time. The flags are blue, red, yellow or white, and square or long and pointed, called pennants. When a square flag is uppermost, it is a danger-signal. Some of the flags are used as letters, and so spell out words. At night, red, green and white lights are used instead of the colored flags, and ships in danger fire cannon and send off rockets. In fog, mist and snow-storms vessels at anchor ring a bell; a steamer moving blows its whistle; sailing-vessels use a horn, all at least once in every two minutes. The signals and their meaning are published in the signal-book, and copies are made in the different languages of the nations using the system.



[*At night, red and white lanterns replace flags.*]

Sig'nal-Ser'vice, United States. There are three authorized systems of signaling: those of the army, of the navy and of the weather-bureau.

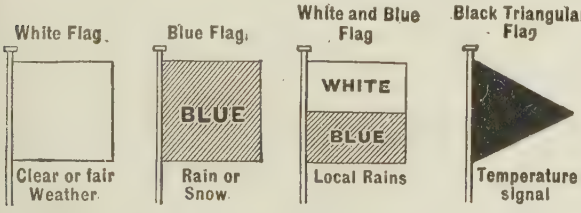
In the army the value of a thorough system was readily seen. In 1860 an appropriation was made to introduce field-signaling under the charge of an officer with the rank of major. In 1863 the signal-corps was placed entirely in the care of a chief with the rank of colonel. In 1870 a meteorological division was added, and in 1891 this was transferred from the war to the agricultural department. There is a school of instruction in military signaling at Fort Riley, Kansas, where, in a course of six months, are given thorough knowledge of all the codes and the practical use of the various sorts of apparatus, consisting of flags, the heliograph, the field-telegraph and telephone trains, used by day; and torches, lanterns, rockets, bombs and search-lights, used by night. The code used in visual signaling is based upon the Morse system of dots and dashes.

In the navy the *General Signal-Book* and the *Fleet Drill-Book* contain the code of day and night signals, so that, in order to send a certain message, it is necessary only to hoist flags representing the number of that message in the proper volume. At night, in place of flags, red and green fireballs are shot into the air to serve the same purpose. For long-distance signaling electric lights are used, and it is even possible to signal a ship below the horizon by casting searchlights upon the clouds.

The weather-bureau has perfected a system of signals by which it can publish the weather-forecasts. Throughout the country are stationed agents who observe the indications of the weather and telegraph forecasts to thousands of towns and cities which then display the appropriate flag, chosen singly or in combination from among the preceding. Temperature is forecasted by placing a black flag *above* the weather-flag for higher, and *below* the weather-flag for lower, temperature.

The approach of a cold wave is announced by displaying the above flag.

Along the seacoasts and on the Great Lakes the following flags signify the approach of dangerous winds:



When storms of exceptional violence are feared, the news is spread through the aid of rockets, whistles and other signals. The reports of the weather-bureau are given wide publicity, chiefly in the pages of the daily newspapers.

Sigourney (*sĭg'ẽr-nĭ*), **Lydia Huntley,** an American writer, was born at Norwich, Conn., Sept. 1, 1791. Her first publication was *Moral Pieces* (1815). She compiled books for the young, contributed to magazines and was one of the earliest women in America to enter authorship. She has been called the American Hemans. *Connecticut, Pocahontas, Tales* and *Letters to Young Ladies* are some of her books. She died at Hartford, June 10, 1865. Consult her autobiographic *Letters of Life.*

Sigs'bee, Charles Dwight, American naval officer, was born at Albany, N. Y., Jan. 16, 1845, and graduated in 1863 from the United States Naval Academy. In the Civil War he served in the West-Gulf squadron and was at the battle of Mobile Bay; in the North Atlantic squadron; and at both attacks on Fort Fisher and the final assault on the fort. He also served on the Chinese station and at the head of various departments of the Naval Academy. He successively commanded the *Kearsarge, Dale, Constellation, Portsmouth* and the *Blake* in the deep-sea explorations undertaken by the United States coast-survey. He was in command of the battleship *Maine* when it was destroyed in Havana harbor, Feb. 15, 1898. During the Spanish-American War he commanded the United States auxiliary cruiser *St. Paul* in operations against Cuba and Porto Rico, and later was transferred to the *Texas.* In 1904 he attained the rank of rear-admiral. He published *Deep-Sea Soundings* and *The Story of the Maine*—a personal narrative.

Sigurd (*zē'gōōrd*) or **Sigurdr** is the hero of the Norse Eddas. Thus he is identical with the Siegfried of the *Nibelungenlied,* which is modelled on the *Volsunga Saga.* Sigurd is a hero, a descendant of Odin, who slays the dragon that guards the golden treasure, and, by eating the heart of the monster, is enabled to understand the songs of birds. He also succeeds in penetrating the flames which surround the house of the sleeping Brunhild, whom he awakens. They plight their troth; and Sigurd rides away. Under the spell of a love-potion he marries Gudrun; and is also persuaded under a spell to deliver Brunhild for Gunnar. Brunhild now seeks to slay Sigurd; but her heart breaks for love of him when he is finally slain by the half-brother of Gunnar.

Sikhs (*sēks*), a religious sect in northern India. The word means followers or disciples. It was founded by Baba Nanak in the 15th century, who rejected the caste-system and idolatry, and taught the worship of one God. At the end of the 16th century the holy temple was built at Amritsar, which is the headquarters of the sect. As they increased in numbers, they gradually assumed military power, and in the 18th century under Ranjit Singh (*q. v.*), a young warlike chief, they became a great military force in the Panjab. He kept the treaty he had made with Great Britain, but at his death his large and well-drilled army invaded British territory in India in 1845. After several battles and defeats they were at last conquered in 1849, and the Panjab was annexed. At the mutiny (1857) the Sikhs remained loyal to England. The Sikhs form about six per cent. of the population of the Panjab, and there are 15 protected Sikh states connected with the Panjab government. They number about 1,907,836. Consult Cunningham's *History of the Sikhs.*

Silas Marner, a story of humble life by George Eliot (1861), considered by many her finest work. To quote her own words, "the story sets forth the good influences of pure, natural, human relations." Silas, the linen-weaver of Raveloe, wrongly accused of theft, leads an isolated, miserable life, his one treasure, the savings of years, being stolen by the squire's son. In its place a little child, Eppie, strays into his cottage and fills his life with joy. Her influence drew him into the stream of the village-life, and he became a natural man again. There is a minor theme in the life of Godfrey Cass, a type of the deterioration of character. This contrast with the regeneration of Silas Marner forms the center around which the author weaves much of the details of the simple village-life. The story is a good moral tonic aside from its specific teachings.

Silesia (*si-lē'shĭ-ȧ*), a province in southeastern Prussia, covering 15,566 square miles. It is crossed by Oder River and the Sudetic mountains, between which is a very fertile region, while on the northern and eastern sides of the Oder there are marshy and sandy tracts. One of the most productive coal-mining regions of Prussia, covering 530 square miles, is in the southeastern corner of Silesia, and there also are mines of zinc. The crops are the usual cereals and flax, beet-root, chicory and hops. The manufactures are important, including linen, cotton and woolen goods, beet-root sugar, metal manufactures, glass and tobacco. The capital is Breslau. The population, including 820,000 Poles, 55,000 Bohemians and 32,000 Wends, numbers 4,942,611. All schools are under the direction of the minister of public instruction, and elementary education is free and compulsory. Silesia in the 10th century was under Polish rule; about the end of the 12th century it was divided into Upper and Lower Silesia; and by the beginning of the 14th it was separated into a number of small states under King John of Bohemia, which in 1526 fell to Austria. Austria and Prussia struggled for the country, the claim of Prussia being based upon a contract by which the duke of Leignitz in 1537 left his lands to the elector of Brandenburg in cast

he had no other heir. The three Silesian Wars (1740-42; 1744-45; and 1756-63 — the Seven Years War) ended in securing Silesia to Prussia, except the Austrian province of Silesia, a country south of Prussian Silesia, covering 1,987 square miles, rich in mines and with a population numbering 680,422.

Silica (*sĭl'ĭ-kȧ*), a compound of silicon and oxygen (SiO_2), is found in the pure state in the form of quartz or rock crystal. Flint, sandstone and chalcedony are nearly pure silica. It occurs also in combination in a large number of abundant minerals which are called silicates, and of which feldspar, mica, hornblende and clay are examples. Silica exists in many plants, particularly the grasses, in the quill-feathers of birds and in sponges. Most animals contain very little of it. Silicon, the nonmetallic element contained in silica, is never found in the free state. Although, next to oxygen, the most abundant element in the earth's crust, it is merely a chemical curiosity, being very difficult to separate from oxygen. Silica is largely used in making glass, and is an important constituent of porcelain, china, bricks etc.

Silicle (*sĭl'ĭ-k'l*), a short silique, the peculiar fruit of the mustard family. See FRUIT.

Silique (*sĭl'ĭk*), the peculiar pod-like fruit of the mustard family, characterized by a false partition which runs lengthwise and divides the pod into two chambers. See FRUIT.

Silk, the cloth and thread manufactured from the fiber obtained mostly from the cocoons of the silkworms. The making of silk probably originated in China, the wife of an emperor being credited with first unwinding a silk cocoon in 2600 B. C. The silkworms' eggs were brought to Constantinople from China about 552 by two Persian monks, who carried them in a hollow cane. They were successful in raising them and in introducing the manufacture of silk. The new industry spread through Greece, was carried into Sicily by prisoners of war, and brought to Spain by the Moors. Louis XI and Francis I imported workmen from Milan into France, and succeeded in starting the silk-manufacture after the cultivation of the mulberry tree for food for the worms had been established in 1564. In England silk-manufacture began under James I, but received a powerful impulse in 1685, when a large number of silk-weavers were driven to England by the Edict of Nantes. James I nade an effort to introduce the industry into the American colonies, sending eggs to Virginia and offering rewards for their cultivation, but tobacco was more profitable. It was cultivated in South Carolina and Connecticut before the Revolutionary War. There have been several efforts to make the cultivation of the silkworm more general in the United States, one in California in 1854 and a Woman's Association formed in Philadelphia in 1876, but with no great result. The manufacture of silk is, however, carried on quite extensively, the center of the industry being Paterson, N. J., where there are more than 100 silk-factories. France is the principal silk-making country, the British silk-trade having been much injured by the introduction of French goods free. The process of manufacture takes the raw silk, obtained from the cocoons of the worm, by winding it off through a reeling-machine; cleans, twists and doubles the threads; and winds them on bobbins and reels for the weaver. There is a considerable amount of waste in all the processes, which, known as waste silk, was for a long time considered useless, but in 1857 a method of spinning yarn out of this waste was invented by Lister of Bradford, England, which has added very much to the industry. The process of weaving silk from the prepared thread resembles that of weaving cotton or woolen goods.

Silk'worm, any larva or caterpillar which produces a silken cocoon used in the manufacture of silk. The name applies especially to the famous silkworm (*Bombyx mori*) that feeds on the mulberry tree. All silkworms are the larvæ of moths. Their eggs are laid to the number of 200 or 300 by a single individual. On hatching, the caterpillars go through several moults. They eat ravenously save just before moulting, and many die during the change of skin. Silkworms are subject to various diseases, great numbers being attacked by a fatal fungous disease. Constant care must be used in rearing them, and strict attention paid to cleanliness, ventilation and temperature. When they reach the fifth stage they eat enormously, and attain a length of three or three and one half inches. They now are naked, worm-like animals of a pale greenish color. About 36 days or more after hatching, they begin the formation of the cocoon, in which they undergo the transformations that convert them into moths. The cocoons are the source of the silk. They usually are white or yellowish and about an inch or more long and half as broad. The silk comes from a pair of long, tubular glands which open upon the lower lip of the animal. As the material of a spider's thread hardens on contact with the air, so this silk substance is formed into a delicate strand.

SILK-WORM, LARVA, CHRYSALIS AND COCOON

While this is issuing from the orifice in the lower lip, the head of the worm is continually worked back and forth in such a manner that the thread is wound in spirals around the entire length of its body. There is formed in this manner one continuous thread of surprising length — being nearly four fifths of a mile long. The thread is matted together by a gummy substance. It is loosened in hot water, and the thread, united with those from four or five other cocoons, is unreeled. The process may occupy four days. There are several kinds of silk-producing larvæ, but all others are inferior to the mulberry silkworm. The *Ailantus* silkworm and the *Polyphemus* moth, with the larvæ of imported mulberry moths, are reared in America. The former feeds on oaks; the latter, the American silkworm, on the leaves of many different kinds of trees. There are various native silkworms. Many portions of the land would seem to be well adapted to silk-culture. China, Japan, Italy, France and India are the principal silk-producing countries. In the manufacture of silk the United States has made great strides in recent years. In 1905 there were 624 silk-mills, their capital $109,000,000. The gross value of products was $133,288,072. Pennsylvania and New Jersey are the principal silk-manufacturing states, Paterson, N. J., sometimes being called the Lyons of America.

Silliman (*sĭl'lĭ-man*), **Benjamin,** an American scientist, was born at Trumbull, Conn., Aug. 8, 1779. He studied at Yale College, and, after his appointment there as professor of chemistry, attended chemical lectures for three years at Philadelphia and for one year at Edinburgh and at London. He filled the chair of chemistry at Yale for about 50 years. He did much to make the study of chemistry and geology popular by public lectures through the country in 1808. He was the first president of the American Association of Geologists and Naturalists, and founded the *American Journal of Science*, known as *Silliman's Journal*, which he edited for 28 years. His textbook on chemistry was published in 1830. He died at New Haven, Conn., Nov. 24, 1864. See *Life* by Fisher.

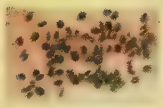
Silo'am, a pool cut in the rocks southeast of Jerusalem and connected with it by an aqueduct.

Sil'vas or **Sel'vas** are the plains which center about the middle of the Amazon. They take their name from the thick jungle or forest with which they are clad. Their area is not far short of 1,000,000 square miles, one sixth of which is subject to periodical floods. No jungle is so thick as that of the *selvas*, where the sun hardly penetrates and mankind is represented only by a few Indians. Animal life, including jaguars, monkeys, birds, snakes and insects, is abundant and of great interest to the naturalist.

Sil'ver, one of the metals, ranking among the commoner metals next to gold in value. It is known by its white color, its luster and the ease with which it is worked. It is harder than gold and takes a fine polish. It is never found pure, being always mixed with a little copper or gold or some other metal, but in what is called its native state it is widely distributed. It is almost always found associated with gold, and all gold when mined contains more or less silver. The combinations of silver with other substances, as sulphur, oxygen and chlorine and especially in the ores of lead, form the largest part of the silver-ores found. In Europe the largest silver-mines are in Germany. Those of Norway have been worked since 1623, and in 1905 produced nearly $400,000. One piece of silver in Copenhagen Museum weighs 560 pounds, and another piece was dug out in Norway weighing over 1,500 pounds. Silver is also found in Spain, Italy, France and Turkey. The mines of silver in the United States are found mostly in Nevada, Arizona, California, Idaho, Utah, Colorado, New Mexico and Montana. Comstock Lode, a silver-mine in Nevada, probably is the most productive one ever worked. The silver-region of the western United States was discovered only in 1859, but now produces about one third of the silver of the world, being $72,535,400 in 1905. The rich silver-mines of Mexico and Peru, worked by the Indians, were developed by the Spaniards after the conquests in the 16th century. Humboldt reports about 3,000 different mines in operation in Mexico, and in 1905 the production was valued at $70,662,893. Australasia is now added to the silver-producing countries, the yearly product of the silver-districts being $16,241,300.

Silver is one of the most useful of the metals, being used in coinage, plate and jewelry, and its compounds in photography, glass-staining etc. It is too soft to be used alone, and is generally mixed or alloyed with copper. Silver-coins in the United States contain one tenth of copper and nine tenths of silver. See METALLURGY. Consult Phillips's *Gold and Silver*.

Sim'coe, John Graves, was born in Northamptonshire, England, in 1752 and died in 1806. He was educated at Eton and at Merton College, Oxford, and when 19 entered the army. His regiment took part at Bunker Hill in 1775. He was appointed lieutenant-governor of Upper Canada in 1792, and took up his residence at Newark near the mouth of the Niagara River. The whole population of the province then did not exceed 20,000. There were a few settlers at Kingston, York, Newark and at the front in the Bay of Quinté district; and some roving bands of Indians. About two months after his arrival the first provincial parliament of Upper Canada met. It consisted of 16



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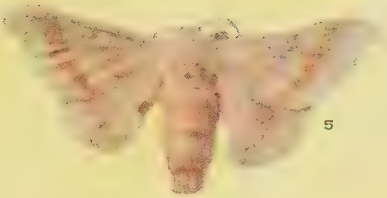

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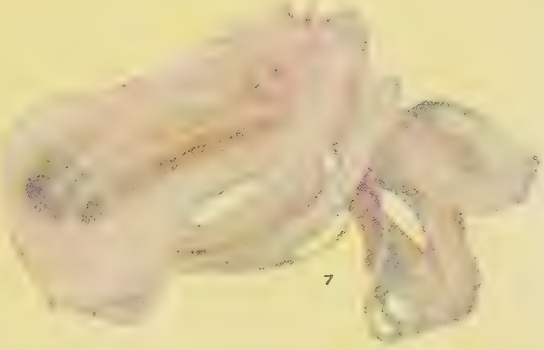

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1—Silkworm Eggs. 2—Silkworm. 3—Pupa in Cocoon. 4—Cocoon. 5—Male Moth. 6—Female Moth.
7—Unspun Silk. 8—Raw Manufactured Silk. 9—Manufactured Silk.

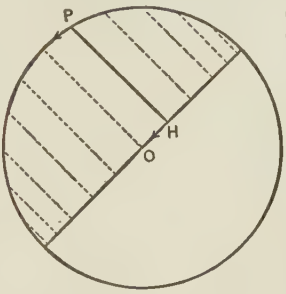
elected, and eight appointed, representatives. He selected York (since 1834 Toronto) as the capital. He took great interest in making surveys and locating roads, one being even now sometimes spoken of as Governor's Road. Simcoe County and Lake are called after him. A monument to his memory has been erected in Queens Park, Toronto, in sight of the new parliament buildings.

Simms, William Gilmore, American historian, novelist and poet, was born at Charleston, S. C., April 17, 1806, and died there on June 11, 1870. In early life he studied law, but abandoned it for journalism and, later, for literature. He specially devoted himself to writing a series of 17 volumes of fiction, including romances of colonial life, romantic tales of revolutionary incidents in South Carolina, of which he wrote a history, a geography of the state and an account of South Carolina in Revolutionary times. He for several years was a member of the legislature, and filled other political offices. He had, besides a fertile mind, a vivid imagination and the power of writing an interesting and realistic novel; he also wrote verse, of which a compilation exists. Of his novels perhaps the most notable are *The Yemassee*, *Guy Rivers*, *Pelayo*, *Carl Werner*, *The Scout*, *The Partisan*, *Count Julian*, *Mellichampe* and *Border Beagles*. His best, as it is his longest, poem is entitled *Atalantis: a Drama of the Sea*. See Geo. W. Cable's *Life* in the American Men of Letters Series.

Simonides (*sī-mŏn'ĭ-dēz*), a Greek lyric poet (B. C. 556–469), a native of the island of Ceos, though early in his career he appears to have been banished and took up his residence partly in the Peloponnesus, with occasional visits to the court of Hiero of Syracuse as well as to the ruling families (the Scopadæ in particular) of Thessaly. He became famous by his dirges, epigrams and funeral inscriptions in honor of those who fell in the Persian Wars as well as in praise of the Athenians who took part in the notable struggle. The chief theme of his song was, in an especial manner, the devotion of Leonides and his 300 at Thermopylæ. In his finished versification, as well as in the choice and variety of his themes, his song has been compared to that of Tennyson. Especially fine are his meter, language and thought. Another of his name is the Greek poet Simonides or Semonides of Amorgos, a native of Samos (about B. C. 660). Only fragments of his work, however, have come down to us.

Simoom (*sĭ-mōōm'*) or **Simoon,** a hot, suffocating wind, common in the deserts of Africa and Arabia. It is very much like a cyclone, with a calm center surrounded by whirling blasts of very hot air, the whole moving slowly from south to north or from east to west. It often carries along columns of sand, and is indicated by a purple atmosphere. It is very injurious both to men and animals, causing severe pain and a feeling of suffocation. It lasts only for a few minutes, not more than 20 at the most, and occurs in spring and summer. See Sirocco.

Sim'ple Harmon'ic Mo'tion is the projection of uniform circular motion upon a diameter of the circle. Referring to the accompanying figure, let P be a point moving with uniform speed in the circumference of the circle. From the point P, in each of its successive positions, imagine a perpendicular let fall upon the diameter there shown. The motion of the foot of this perpendicular H to and fro along the diameter is a simple harmonic motion, and is often indicated by the letters S. H. M.



SIMPLE HARMONIC MOTION

The circle in which we have imagined the point P to move is called the *circle of reference*. The radius of this circle is known as the *amplitude* of the S. H. M. The time occupied by one round trip of the point H to and fro across the diameter is called the *period* of the S. H. M. The angle between the radius OP and the radius from which angles are measured in this circle is called the *phase* of the S. H. M. The value of the phase at the instant from which time is measured is called the *epoch* of the S. H. M. The distance of the point H from the center of the circle at any instant is called the *displacement* of the S. H. M.

Any S. H. M. is completely described only when we know four things about it, namely: (1) the *amplitude;* (2) the *period;* (3) the *phase* at any time, t; and (4) the *direction* of motion of the point P in the circle of reference. If we denote the amplitude by A, the period by T, the phase by θ and the displacement at any instant, t, by x, then the equation of S. H. M. is

$$x = A\cos.\ \frac{2\pi}{T}t$$

where $\frac{2\pi}{T}t = \theta$

No one motion in nature is more frequently met with than S. H. M. The motion of a freely suspended pendulum-bob is practically simple harmonic. A ball suspended by a vertical, spiral spring oscillates up and down in a vertical line with a S. H. M. Air-particles set in motion by a tuning fork vibrate to and fro with

a S. H. M. Ether-particles when traversed by a ray of light probably vibrate with a S. H. M. Consult Worthington's *Dynamics of Rotation* or Daniell's *Physics* for more complete discussion.

Simp'son, Sir **James Young,** a Scotch physician, was born in Linlithgowshire, June 7, 1811. He studied in Edinburgh, attracting attention by his ability and especially by his thesis on *Death from Inflammation* when he took his medical degree. He rose rapidly in his profession, contributing largely to the renown of the Edinburgh school. In 1847 he was made one of her Majesty's physicians for Scotland His greatest claim to distinction rests on his introduction of chloroform into medical use in March of 1847. His publications include a large number of medical works. He died on May 6, 1870. A bronze statue of him was erected in Edinburgh in 1877. See *Memoir* by Duns.

Sinai (*sī'nī*), a mountain in northwestern Arabia, known as the place where Moses received the tables of stone inscribed with the Ten Commandments. The mountain is a single peak in a great rocky mass which almost fills the peninsula of Sinai, a point between two arms of the Red Sea: the Gulf of Suez and the Gulf of Akaba. There are three separate mountains, Mount Catherine being the one usually thought to be indicated by the name Sinai. This mountain has two peaks, the northern one, known as Mount Horeb, and the southern one, called the Mountain of Moses. This sonthern peak is generally agreed upon as the place of the giving of the law, though it is still disputed. At its foot is the Church of St. Catherine, built about 527 by Emperor Justinian; a little higher up, the chapel of St. Elias; and on the summit a little pilgrim-church. The whole peninsula, as well as the bold, jagged mountains, has a stern, treeless aspect, though palms, acacias and tamarisks grow in the ravines. The Bedawin Arabs range over the region with their sheep and goats. There are many caves among the mountains, which have been the abodes of hermits, and many inscriptions on the rocks which date back to the era of the early Christians. Consult Dean Stanley's *Sinai and Palestine* and E. H. Palmer's *Desert of the Exodus.*

Singapore (*sĭn'gȧ-pōr'*), ("Lion City"), a town of India on the island of Singapore. It was founded in 1819 for the British trade in the East Indies, and is the most important trading-place in southeastern Asia. It is a well-built town, with fine public buildings and all kinds of conveniences in the way of public works. There are a governor's residence, a Protestant cathedral, a Roman Catholic cathedral, Mohammedan mosques, Hindu temples, Chinese joss-houses, a museum, hospitals and fine botanical and zoölogical gardens. The harbor is large, and is used as a naval coaling-station and depot. The island is 27 miles in length and 14 miles in breadth and has an area of 206 square miles. The population, numbering 228,555, includes 135,000 Chinese, 25,000 Malays and about 4,300 Europeans. Singapore, a crown-colony in the Straits Settlements, embraces Christmas and the Cocos Islands, the other settlements being Penang and Malakka. The climate is pleasant, though the death-rate is high.

Sin'gle Tax. A theory of taxation which proposes to abolish all taxes that fall upon property gained through industry and economy, substituting a single tax on land equal to its rental value exclusive of improvements. Thus the "unearned increment," as represented by the increasing value of land, would accrue to the benefit of the community as a whole and not to the private owner as at present. It would probably result in state ownership. This form of taxation was proposed and earnestly advocated by Henry George, who presented his argument in *Progress and Poverty* in 1879, and in his New York City mayoralty campaigns in 1886 and 1897. The Single-Tax National League of the United States, in a national conference in New York City, 1890, adopted a platform drafted by a committee of which Mr. George was chairman. Since the death of Mr. George in 1897 the movement has lost in adherents and in political influence. The theory has gained world-wide prominence. Tom L. Johnson, Mayor of Cleveland, and Ex-Governor Garvin of Rhode Island are politically successful single-taxers. The party in the United States has acted with the Democrats and in England with the Liberals. There they hold office in many cities and claim that their adherents control Glasgow; but on the Continent they have barely gained a foothold. The single-taxers now demand a separate assessment of personal property, land and improvements on land and that local political units be authorized to place a tax upon land-values and to free personal property from taxation.

The arguments in favor of the single tax are based upon the two principles of equity and convenience. First, the right of private ownership is given by labor only, and, as land in no way is a product of man's labor, it should be equally shared by all; the increase in the value of land depends upon the development of the community, and therefore the increment should belong to the community rather than to the individual. Second, land can be easily assessed and always guarantees payment of taxes. The weight of such a tax will, it is claimed, be equal upon all and will not bear upon production and industry. The tax would be assessed upon land according to its

value, and would discourage holding land for speculation, since it must pay in proportion to value rather than income. It would tend to equalize the distribution of wealth, since the natural increase in the value of land would go to the community, and, finally, tend to a large increase of social wealth.

The objections come from those who believe in private ownership of land and from Socialists. The former hold (1) that the landowners have put their industry into the land, even if they have not produced it; (2) that single tax would not produce sufficient revenue; and (3) that the sense of private ownership of land has been the "keystone of society." Socialists hold that both land and capital should be the property of society; that capital is not the product of the labor of any individual or of the few; and that, therefore, single tax would be only a half-solution and one that would not benefit society. See GEORGE, HENRY, and SOCIALISM.

Sioux (*sōō*), a group of tribes of American Indians belonging to the Dakota family. They are the principal tribe of the family, and sometimes their name is given to the whole family. They were living near the head-waters of the Mississippi when found by the whites. In their wars with the Chippewas and the Hurons some of them were driven farther south, but in 1822 they numbered about 12,000 and their lands stretched from the Mississippi to the Black Hills. In 1837 and in 1851 they ceded parts of their land to the United States. The failure of the government to carry out their treaties irritated the tribes, and they troubled the white settlers for years and in 1862 made a general uprising, killing nearly 1,000 whites. New Ulm, in Minnesota, a town of 1,500 people, was nearly destroyed. This rebellion ended in the imprisonment of more than 1,000 Indians and the execution of 39 of the leaders, and cost the United States $40,000,000. The Santee Sioux were placed on reservations near Yankton, S. D., where they have become peaceful farmers. After a vain endeavor to settle matters peacefully, Sitting Bull (*q. v.*), a young chief, and others going to Washington for the purpose, the hostile tribes gathered in northern Dakota and began the war of 1876, in which General Custer perished. Large settlements of the Sioux have been made since in South Dakota. In 1890, under a "messiah," there was another rising of the Sioux in the northwest. They now number about 25,000. Consult Riggs's *Forty Years among the Sioux*.

Sioux City, Ia., a city on the Missouri, which is crossed by a bridge 2,000 feet long, and by a combination structure for the use of wagons, street-cars and railways. It is a railroad-center and a manufacturing city, and has a large trade, being situated in a fine farming-region. There are large meat-packing establishments and flaxseed-oil mills and vast quantities of stoneware; 25,000,000 bricks a year are made. Among the notable buildings are the city-hall and public library, the Federal building and the Young Men's Christian Association building. The city has a good system of public schools, the high school erected at a cost of $100,000, and here is Morningside College, a Methodist Episcopal institution. It is the county-seat of Woodbury County. Population 45,000.

Sioux Falls, So. Dak., the largest town in the state, is on Big Sioux River and takes its name from the falls which descend 90 feet and afford an excellent water power. The city was laid out in 1857, and destroyed by the Sioux in 1862. It was rebuilt in 1865 after Fort Dakota was abandoned. The buildings are nearly all of red quartzite. The great industry is the quarrying and polishing of the quartzite underlying the city. There also are numerous manufactories, 66 wholesale houses, a state penitentiary, a public library, six banks, ten public schools, six colleges and denominational schools, twelve churches and six railroad-systems. It is the county-seat of Minnehaha County. Population 15,000.

Siphon (*sī'fŏn*), an instrument for transferring liquid from a vessel at one level to another at a lower level. The simplest possible form is shown in the accompanying figure, where the liquid A is being emptied into the vessel D. In order to start a siphon the pressure of the air must be diminished in the branch C D. The pressure of the atmosphere on the surface B then forces the liquid up the arm A C, and, in flowing down the arm C D, this liquid acts as a pump and keeps the pressure in C D below that of the atmosphere. Evidently, however, this pumping must cease as soon as the liquid in the vessel D rises to the same level as the surface B. It is also clear that, since the water is driven up into the arm A C by means of the earth's atmosphere, no siphon will work in a vacuum. The safest and most convenient form of siphon, especially

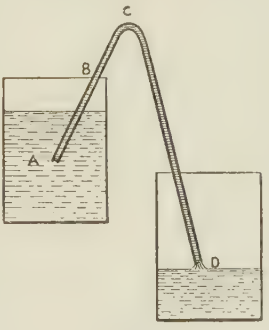


FIG. 1

FIG. 2

for transferring acids is that shown in figure 2, which is provided with a mouthpiece for starting, but without danger of getting acid or poison into the mouth. The action will be evident from the figure.

Siphonogamy (*sī-fŏ-nŏg'ă-mĭ*), a condition in plants in which pollen-tubes are developed for the transfer of the male cells to the eggs. The seed-plants are siphonogamous; while in the lower plants the male cells usually swim to the eggs. As a consequence, the *Spermatophytes* are called Siphonogams by some botanists.

Si'rens, sea-nymphs in Greek mythology, who sat on the shores of an island off the southwest of Italy and by their songs lured passing sailors to death. The *Odyssey* tells the story of Ulysses stopping the ears of his companions with wax and lashing himself to a mast, till they had sailed out of hearing of the fatal songs. The Argonauts also were carried past in safety, because the music of Orpheus had a stronger spell, seeing which the sirens threw themselves into the sea and were turned into rocks. By the Latin poets they are represented with wings, and in art as birds, with the faces of young women. Consult Harrison's *Myths of the Odyssey in Art and Literature.*

Sir'ius. See DOG-STAR.

Siroc'co, a hot wind which blows on the southern coasts of Italy, lasting sometimes a week. It is hottest in Malta and Sicily, but does not last as long as on the Ionian Islands. It is like the simoom, and produces the same feeling of suffocation and exhaustion. See SIMOOM.

Sisyphus (*sĭs'ĭ-fŭs*), in Greek mythology, the son of Æolus, the founder and king of Corinth, and noted for his wickedness, for which, according to Homer, he was condemned to roll a large stone up a hill, which, when it reached the top, fell back again, so that his task was never ended.

Sit'ka, the capital of Alaska, is on the western coast of Baranoff Island. It has a deep harbor, dotted with islands, with snowy peaks rising behind the town. There are a fine green-spired Greek church and an old Russian palace. The climate is cold, with a large rainfall. Population 1,395. See ALASKA.

Sit'ting Bull, an Indian warror of the Sioux (*q. v.*) was born in 1837. When gold was found in the Black Hills, an effort was made by the United States to purchase the land of the Sioux, to whom it belonged. They were very unwilling to give it up, and Sitting Bull, Red Cloud and Spotted Tail, with other chiefs, visited Washington in May, 1875, but would not sign the treaty. The failure of the government to keep its promises and the actions of the settlers in pushing on to the lands kept up a feeling of hostility, and the young braves gathered around Sitting Bull in northern Dakota. General Custer, with a small force, was sent against them, and he and his followers were all killed; but the Sioux were at last conquered and Sitting Bull escaped to Canada, but on promise of a pardon surrendered. In the rising of the Indians of the northwest in 1890 Sitting Bull was killed.

SITTING BULL

Six'tus, the name of five popes.

Sixtus IV was born on July 22, 1414, near Savona, Italy. He had a great reputation as a preacher throughout Italy. He became pope in 1471. He exhausted the treasures of the papal church in providing for his relatives, and took part in a conspiracy against the Medici at Florence. Learning and, especially, the improvement of Rome owed much to him. He built the Sistine chapel and the Sistine bridge across the Tiber, increased the Vatican library, and patronized the great painters of his time. His union with the Venetians against the duke of Ferrara brought on an Italian war, which ended in the breaking up of the Venetian alliance. The pope is said to have died from mortification at this result, Aug. 13, 1484. Consult Ranke's *Lives of the Popes.*

Sixtus V, one of the ablest of the popes, was born on Dec. 13, 1521, near Montalto, Italy. He was a professor of theology at Rimini and Siena, an eloquent preacher, vicar-general and cardinal. While Gregory VIII was pope, Sixtus lived in retirement and was thought to have become old and infirm, which recommended him to the cardinals, who were to select a successor to Gregory. But those who thought to lead him were soon undeceived by his vigorous administration. He stopped disorder, improved the working of the laws, and gave liberty to the Jews to worship in their own way and trade in his dominions. He built the library buildings of the Vatican, authorized a new edition of the Septuagint and the Vulgate, and in every way carried out his policy of increasing the power of the Roman church against the Huguenots, the Lutherans and Queen Elizabeth. He died on Aug. 27, 1590. Consult Ranke's *Lives of the Popes.*

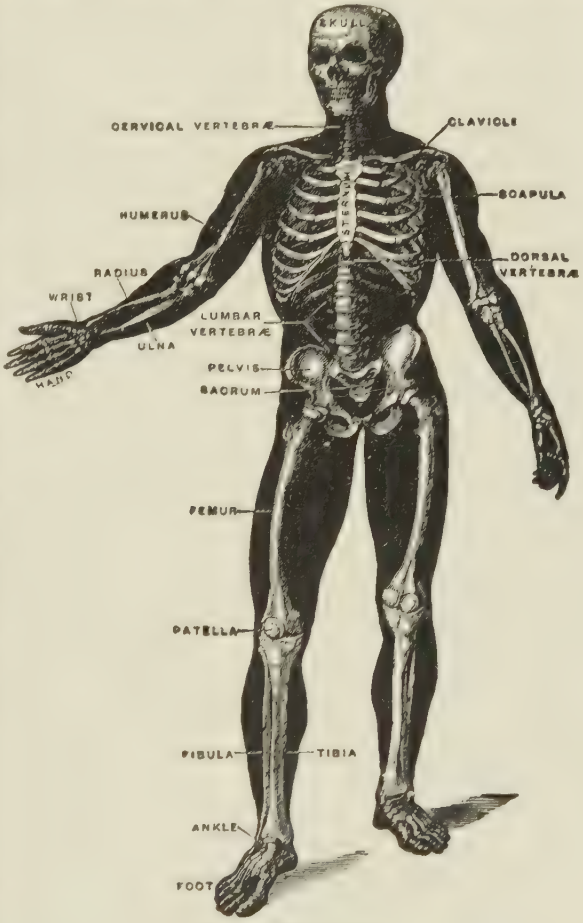
Skag'er-Rack (*sgăg'ĕr-rȧk*), an arm of the North Sea, between Denmark and Norway. It is 140 miles long and 70 broad. It is subject to violent storms, but when quiet the current runs east on the coast of Denmark and west on that of Nor-

way. The harbors are all on the coast of Norway.

Skate, a common name of several kinds of the ray. The tobacco-box skate, barn-door-skate and briar-skate are American varieties, and the tinker and the gray skate are found in Scotland and in England. Their egg-cases, called mermaid's purses, are often thrown upon the beach. The flesh is coarse, and the expanded fins are the parts usually eaten.

Skat'ing is moving on the ice by means of steel blades fastened to the soles of the shoes, called skates. In early times the shin-bones of animals were tied to the feet, and, by using a stick to push with, the wearer could move over the smooth surface of the ice. Skates now used are of two kinds, those for speed and those for figure-skating. The blades for speed-skating are very thin and are longer than the foot, while those for making figures are broader and are rounded at the toe and heel. In the northern countries of Europe, where the ice has a slight covering of snow, skating is very popular. The motion is rapid, the Frieslanders often traveling 15 miles an hour. Skate-racing is often practiced, the fastest time yet made being a mile in two minutes and 52 seconds. Figure-skating is practiced in America, Canada, Holland, Germany, Norway, Sweden and Denmark. Ice-rinks are used for this amusement, and are often crowded with spectators. Wheel-skates or roller-skates were invented in 1865, by Mr. Plimpton, of New York, though a form of them had been patented in France in 1819. The use of them is a fine preparation for skating, and the amusement has been very popular.

Skel'eton, the hard parts of an animal. Accepted in this broad sense, the skeleton includes the hard outer covering or exoskeleton and the inner bones or endoskeleton. As examples of exoskeletons we have the shells of clams, snails and other mollusks; the shell or *test* of the sea-urchins; the limy plates of the star-fishes; the shell of the lobsters and cray-fishes; the bony carapace and plastron of turtles and the like. The internal bony framework of vertebrated animals is an endoskeleton consisting of bones and cartilages. The comparative study of endoskeletons leads to many interesting conclusions. There are similar or homologous parts in all. For example, the wing of a bat or bird is constructed on the same plan as the flipper of a seal, the fore-limb of a dog, a horse or a man. That is, corresponding bones can be made out in them all. The same is true of hind-limbs and other parts of the skeleton, including the skull. This serves to unite animals on the line of similitude of structure. The hard parts are for protection, when on the outside, and also for the attachment of muscles. Not only is there correspondence between the bones of different animals, but the muscles, nerves and blood-vessels are similar. The fossil bones of extinct animals have furnished clues to the past history of life on the globe. There are upwards of 200 separate bones in the human skeleton. The actual number of distinct bones varies at different periods of life; many bones which are separated in youth become united in old age. The skull has 22 distinct bones in early adult life; but in youth the number is larger and in old age less. There is a tendency for the bones to unite in old age. There originally are 33 separate bones in the spinal column.



HUMAN SKELETON

Twenty-four remain distinct through life, while the lower nine become consolidated into two groups: the sacrum and the coccyx. Twenty-four ribs bound the chest, and most of them are connected by cartilage with the breast-bone or sternum. The shoulder-blades, the collar-bones and two hip-bones are connected with the arms and limbs respectively There are 30 bones in each arm and the same number in each leg, counting the knee-pan. The bones are held together by ligaments. See the illustration for further names. See FOOT, HAND and SKULL.

Skim'mer, a class of web-footed, long-winged sea-birds, belonging to the gull family. They have a long, thin bill with the upper half shorter than the lower. There are only three known species, each being confined to one country. The American skimmers, called shearwaters, skim along the surface of the water in flocks, using the lower part of the bill as a plow to bring up the small fish on which they feed and holding them with the upper half of the scissors which their bills form. They are also called scissors-bill or razor-bill shearwaters. The other varieties are found in Asia and Africa. See GULL.

Skin, the investing membrane of the body of an animal. In vertebrated animals it consists of two layers: an outer epidermis and an inner dermis or true skin. The former is largely for protection, the latter plays an important part in physiology. The epidermis has neither blood-vessels nor nerves, but the true skin is richly provided with both. The dermis is made of a dense felt-work of fibers, and in the human body is from one fiftieth to one tenth of an inch in thickness in different parts of the body. Its outer surface is raised into little hillocks called papillæ. These are of two kinds — the vascular papillæ containing a network of minute blood-vessels, and the nervous papillæ in which the nerves terminate. There often is an oval touch-corpuscle in which the nerve has its ending. The epidermis lies on the dermis and dips into all of its depressions. It is composed of cells, the outer layers of which are reduced to flattened, scale-like elements, which are continually falling off or being removed by bathing and friction. They are as continually renewed from a deeper layer of plump cells which divide rapidly. Thus the outer skin has two layers — a horny layer and a mucous layer. The latter is the seat of the pigment or coloring granules which impart color to the skin. In negroes it includes a rather dense layer of dark granules. All over the body the skin has minute orifices which are the openings of small tubes connected with the sweat-glands. These consist of coiled tubes in the deepest part of the true skin or just below it. A tubular duct extends from each gland to open on the surface, and as it passes through the layer of the skin it runs in spirals like a corkscrew. The number of sweat-glands varies greatly in different parts of the body; they are fewest in the back and neck, being about 400 to the square inch. On the skin of the palm and sole there are two or three thousand to the square inch. Hairs, nails, hoofs, scales and like structures are outgrowths from the epidermis of the skin. (See HAIR and FEATHERS.) The skin performs important offices. The watery vapor passed off by it in the form of perspiration amounts to about 2½ pounds a day. It also liberates carbon dioxide. In some animals, as frogs, it is an important aid in respiration. It is also concerned in regulating the temperature of the body. When the body is covered with a varnish or layer of leaf-metal, death results, not from stopping the perspiration as was formerly supposed, but by radiation of heat and fall of bodily temperature — the skin being unable under the conditions to regulate the temperature. The touch-corpuscles in the skin give it an important sensory action in connection with the nervous system.

Skull, the hard framework of the cranium including the lower jaw. The skull in fishes and in mammals, although so different in general appearance, is composed of corresponding bones. They are more separated in the fish, and more modified and united in the higher animals. In sharks and other cartilaginous fishes the skull may be entirely cartilaginous throughout life. The question of the nature of the skull perplexed naturalists for a long time. Early in the 19th century Oken, the German philosopher, and Goethe, the poet-philosopher, declared the skull to be composed of modified vertebræ. This idea was extensively developed by Richard Owen, in his great work on *Comparative Anatomy of the Vertebrates.* Thus arose what was called the vertebral theory of the skull. Huxley, however, in 1859 showed that the bony cranium is preceded by a skull of united cartilage, having neither sutures nor joints. The bones are formed later, being mostly laid down in the membranes surrounding the original cartilaginous skull, which disappears. Consequently the bones are not primary structures, and the history of the skull shows that they cannot represent modified vertebræ. By comparing the skulls of different animals corresponding bones can be identified, but the study is technical. Consult Huxley's *Anatomy of Vertebrated Animals* and Parker and Bettany's *Morphology of the Skull.*

Skunk, a carnivorous animal widely known on account of the offensive odor of a fluid which it ejects when frightened or disturbed. There are several varieties found only in the New World both in North

and South America. The common skunk is about the size of a small cat, and ranges from Hudson Bay to Guatemala. The body is rather stout, the tail very bushy, and the prevailing colors black and white. It usually is black, with broad stripes of white running lengthwise. These animals burrow and are active at night. They feed on mice, salamanders, frogs and eggs of birds that nest very low. Sometimes they rob hens' nests, but this is by no means the rule. They are of positive benefit to the farmer on account of the large number of beetles, grasshoppers and field-mice which they destroy. Ordinarily they do not run at the approach of man, but, conscious of the protection of their nauseous secretion, move away deliberately. They can eject this fluid at will eight or 12 feet. They prowl around chiefly at dusk and after dark. They are quite bold and fearless, coming close to camp and dwelling, a pair often taking up abode under barn or porch. The flesh is said to be white and sweet. Owing to the present scarcity of the more valuable fur-bearers, the fur of the skunk is now extensively used, and in the market goes under the name of Alaska sable.

Skye (*skī*), the largest island of the Hebrides, off the west coast of Scotland. It is 49 miles long and from seven to 25 broad. It is mountainous, with a few tracts of pasture and one large plain. The highest peak of the mountains, called Coolin Hills, is 3,234 feet high. Lake Coruisk, the "dread lake" of Scott's *Lord of the Isles*, and Glen Sligachan, thought to be the grandest glen in Scotland, with columns and cliffs over 1,000 feet high, with waterfalls leaping over them and deep caves at their foot, are among the interesting scenery. Fish abound, and with potatoes form the main diet of the people and also furnish the principal industry. The inhabitants (who chiefly are crofters) are principally Celtic, speak Gaelic, and number 14,608. The principal proprietors are Lord Macdonald and MacLeod of MacLeod. Consult Smith's *A Summer in Skye*.

Sky'lark, an European bird that mounts high in the sky and sings on the wing. It is the lark of the poets. The larks of America belong to a different family. See LARK.

Sladen, Douglas (Brooke Wheelton), was born in London, England, on Feb. 5, 1856, and educated at Trinity College, Oxford, becoming first professor of history in the University of Sydney, N. S. W., spending four years in that colony. He has travelled extensively and published much about the countries he has seen, being an extensive contributor to Australian literature. In this connection may be mentioned *Australian Lyrics*, *Poetry of Exiles*, *A Summer Christmas*, *Australian Ballads*, *A Century of Australian Song* and *Australian Poets*.

Slate. See SHALE.

Sla'ter, Samuel, an Englishman who introduced the manufacture of cotton into the United States, was born at Belper, Derbyshire, in 1768, and died at Webster, Mass., in 1835. Slater was an apprentice under Strutt, the partner of Arkwright. When he quitted England (1789), he did so secretly for fear that efforts might be made to prevent him from introducing Arkwright's machinery abroad. Relying wholly upon his memory, however, he did so; and in 1790 he succeeded in founding the first American cotton-factory at Pawtucket, Rhode Island. He afterwards built mills at Webster, Mass. The town of Slaterville grew up from the homes of his workmen. In 1816 Slater also built woolen-mills at Webster, Mass. He was a liberal and philanthropic employer and the founder of schools for the children of his workmen.

Sla'very, the condition of a man who belongs to a master, who has the right to employ him and treat him as he pleases. It probably arose first from captives made by war. It was general among ancient nations, including the Jews. In Greece slaves were employed not only for domestic service, but as bakers, tailors, seamen, miners, soldiers and police. They usually were mildly treated and were often freed. A slave was not allowed to wear his hair long or to enter the gymnasia and public assemblies, but could appear in the temples and at festivals. At one time there were 200,000 slaves in Attica, three times the number of the freemen. Roman slavery was very severe, as is seen by their gladiatorial combats. Old and useless slaves were often left to starve on an island in the Tiber. The cruelty of the masters was gradually softened by the law, a very cruel one being obliged to sell his slaves. The slave could not own property, though sometimes allowed a small portion of his gains when in trade, and could not testify in the courts. In Britain the Anglo-Saxons made slaves of the Celts and other natives, and had a regular trade with the continent in Irish slaves; but with the Norman conquest slavery was merged into serfdom. The traffic in slaves continued among Mohammedan nations, Christian captives being sold as slaves in the markets of Asia and Africa. The Barbary corsairs, down to 1812, carried off large numbers from the coasts of Europe into slavery. Cervantes, for five years a slave, reports 25,000 Christian slaves in Algiers alone. During the middle ages in Europe the class called serfs were, practically, slaves. They were usually attached to the soil and could be transferred with the land they tilled. They could not hold property, but their oath was taken in evidence and, if injured, they were protected by law.

Serfdom died out in England and in Scotland gradually, a curious form remaining in Scotland to the end of the 18th century. Colliers and saltworkers were bound by law, on entering a coal-work or salt-mine, to life-service there; their labor was transferred with the ground; and their sons could follow no other trade nor seek employment in other mines. In France the Revolution swept away the last remains of serfdom, and in Italy it had ended in the 15th century. It was abolished in 1781 in Bohemia and Moravia, and entirely destroyed in Prussia by the reforms of the 19th century, though the mass of the peasants had been free since the end of the 13th century, while Russia put an end to the system in 1861.

Negro slavery of modern times was a result of the discovery of America, the Spanish introducing them first into the New World to work their mines and plantations. They were first used to any extent in Haiti, in San Domingo. Sir John Hawkins was the first English slave-trader, followed by others, until England had carried to America 300,000 slaves between 1680 and 1700, and 610,000 into Jamaica alone between 1700 and 1786. The slave-trade was very inhuman, the negroes being so crowded on the ships that a large proportion died on the passage. The first efforts to restrain slavery were made to stop the slave-trade. In 1787 a society for this purpose was formed in London, with such supporters as Clarkson, Wilberforce, Zachary Macaulay and Sharp. After years of struggle the abolition bill, making all slave-trading by British subjects illegal after Jan. 1, 1808, became a law on March 7, 1807. The movement continued until, on Aug. 28, 1833, an emancipation bill was passed giving freedom to all slaves in the British colonies. Slavery was abolished in the French colonies in 1848, in the Dutch ones in 1863 and in Brazil in 1888.

When the American colonies became the United States in 1776, there were 300,000 slaves in the country, and in 1790, at the taking of the first census, they numbered 697,897, and were in all the states except Vermont and Massachusetts, to which Maine then belonged. The northern states gradually abolished slavery, Pennsylvania having 64 as late as 1840. In the south many, with such leaders as Washington and Jefferson, opposed slavery until the invention of the cotton-gin made it profitable and developed it, when even the renewing of the slave-trade with Africa, abolished by the United States in 1808, was advocated. The contest between the upholders and the opposers of the system, beginning in the north with the formation of societies for the gradual abolition of slavery and carried on by literature, lectures and, finally, political parties, was met in the south by demands for enlarged territory and national laws protecting their slave-property in the free states. The Pennsylvania Abolition Society was founded in 1775, with Benjamin Franklin as president, and the New York Society, with John Jay and Alexander Hamilton as leaders. In 1831 Garrison established *The Liberator*, the antislavery journal. The formation of a northern republic, free from slavery, was the hope of the extreme abolitionists, as the formation of a southern republic founded on slavery was the aim of the extreme proslavery party. The contest ended in the Civil War of 1861–65, in the course of which the proclamation of emancipation was issued by Lincoln, Jan. 1, 1863, setting free nearly 4,000,000 slaves, and confirmed in 1865 by an amendment to the constitution approved by 27 of the 36 states.

Slavery still exists, and the slave-trade is carried on by Arab slave-traders in the interior of Africa, the tracks of their caravans being whitened by the bones of those who have died on the journey, and by the Portuguese. The Congo Free State, the foundation of missions and the encouragement of trade by the British and German companies, with the help of all Christian governments, will, it is hoped, finally end the terrible traffic, in which over 90,000 000 Africans have been enslaved. Consult Clarkson's *History of the Slave-Trade* and Wilson's *Rise and Fall of the Slave-Power in America*.

Slavs (*slävz*) or **Slavonians** (*slȧ-vō'nĭ-anz*), the name of a group of nations belonging to the Aryan family, living in the eastern parts of Europe and northern Asia. The earliest history represents them as living around the Carpathian Mountains and spreading to the Baltic, the Elbe and over the whole peninsula between the Adriatic and the Black Sea. Since the 7th century they have become settled and gradually formed into independent states. There are two divisions, the southeastern and the western. The Russians, Bulgarians and Illyrians belong to the first division; the Poles, Silesians and Pomeranians, called Lechs, the Czechs or Bohemians and the Slavonic tribes of north Germany make up the western division. The only people that have preserved their language are the Wends or Serbs of Saxony and Prussia. The whole Slavonic population is about 100,000,000. They are represented by ancient writers as an industrious race, living by agriculture and having flocks and herds. The government, at first patriarchal, was gradually usurped by the chiefs and the people were reduced to serfs. There was no middle class between the nobility and the peasants. See LANGUAGES and LITERATURE.

Slidell (*slī-dĕl'*), **John,** an American lawyer and politician, was born in New York

City about 1793, and died at London, England, July 29, 1871. After graduating at Columbia College, he studied law, and, removing to New Orleans, practiced there and became a leader in Louisiana politics. From 1842 to 1845 he served in Congress as a state-rights Democrat. From 1853 to 1861 he was a member of the United States senate, and in the Civil War, when Louisiana seceded, he withdrew and was appointed Confederate minister to France. In company with James M. Mason, who was named minister to England, both were taken on the high seas by Captain Wilkes of the United States navy and brought as prisoners to the United States, where they were confined in Fort Warren. On the demand of England they were released, however, and proceeded on their respective missions. In France, aided by the sympathy of Napoleon III for the Confederate government, Mr. Slidell, though unable to secure recognition for his government, procured a ship, the *Stonewall*, for the Confederacy, and negotiated with French capitalists for a loan of $15,000,000. After the war closed, Mr. Slidell settled in England and resided there until his death.

JOHN SLIDELL

Slime-Moulds. See MYXOMYCETES.

Sloane, William Milligan, American educator and author, was born at Richmond, O., Nov. 12, 1850, and graduated at Columbia College in 1868, continuing his studies at Leipsic and at Berlin. At Berlin he acted at the same time as secretary to George Bancroft, then United States minister to Germany, aiding him in his historical work. From 1876 to 1883 he was assistant and professor of Latin at Princeton University, and from 1883 to 1896 occupied the chair of history, with intervening visits to Europe. Since 1896 he has been Seth Low professor of history at Columbia University, New York City. He has also been editor of the *New Princeton Review* and one of the conductors of the *American Historical Review*. Among his writings are the *Life of Renwick Sloane* (his father), *The French War and the Revolution*, *Life of James McCosh* and *Napoleon Bonaparte, a History*.

Slo'cum, Henry W., American general, was born on September 24, 1827, at Delphi, Onondaga County, N. Y. He graduated from West Point in 1852 and was assigned to the 1st artillery, with the rank of second lieutenant. After promotion to first lieutenant in 1855, he resigned in 1856, practiced law at Syracuse, and was elected to the legislature in 1860. On the outbreak of the Civil War he was commissioned as colonel of the 27th New York volunteers and took part in the first battle of Bull Run. In August he was made a brigadier-general, taking part in McClellan's peninsular campaign in 1862. He distinguished himself at the battles of Gaines' Mill, Glendale and Malvern Hill and was promoted to major-general of volunteers. He fought at second Bull Run, South Mountain and Antietam, and as commander of the 12th corps rendered signal service at Fredericksburg, Chancellorsville and Gettysburg. Later he was transferred with his corps to the army of the Cumberland, succeeded to the command of the 20th corps, and was the first to enter Atlanta. In Sherman's march to the sea and through the Carolinas he commanded the left wing, taking part in the actions of that campaign. After the war he took up the practice of law at Brooklyn and was elected to Congress in 1870 and 1884. He died at Brooklyn, N. Y. April 14, 1894.

Sloe, a wild plum, also called blackthorn. It is a shrub growing from four to ten feet high though sometimes forming a small tree. The branches end in sharp points or spines. The flowers are white, appearing before the leaves. The fruit, about the size of large peas, is sometimes made into preserves, but is bitter and little used. The leaves resemble tea-leaves and have been used to adulterate tea, and the juice is used in making an inferior port-wine. The wood takes a fine polish and is used for tool-handles and canes. The sloe is thought to be the original of all the European varieties of the plum.

SLOE

Slot-Machine', a familiar, mechanically adjusted contrivance for vending chocolate, caramels and other sweets, and popularly known as nickel-in-the-slot or penny-in-the-slot machines, at railway stations, hotels, seaside or other places of public resort. They are variedly arranged, but the usual device is that when the would-be purchaser of the commodity or commodities offered for sale drops a coin into the slot and turns

a handle the commodity is released and the coin falls into a receptacle, to be afterwards collected by the vendor's agent. Somewhat similar contrivances also are in use as weighing-machines, a pointer indicating the weight of the person, who, after dropping a coin in the slot, steps on the machine-platform to be weighed.

Sloth, any one of a group of sluggish mammals living on trees in the forests of Central and South America. Their limbs end in hook-like claws, and they are the most strictly tree-inhabiting of all animals. They usually cling to branches with their backs downward. They crawl with difficulty on the ground and rarely descend to it. They are covered with long, coarse hair, the shafts of which are roughened or fluted. This hair is naturally grayish, but in the damp forest it is covered with a growth of algæ, imparting a peculiar green color which makes the animal difficult to distinguish among the foliage. The algæ disappear in a dry climate, and the hair resumes its natural color. They feed upon leaves, young shoots and fruit. They are silent, inoffensive animals and move mostly at night. About ten species are known. Fossil sloths of colossal size have been found in the rocks.

Sloyd. In Sweden *sloyd* or *slöjd* originally meant any kind of trade. In 1872 the Swedish government perceived that, owing to the spreading of the factory-system, *hem-sloyd* or the home industries of the people was declining, and it therefore sent men round the country to lecture upon these industries. At the same time the Nääs school was established by Otto Salomon to give children training in these trades. In this school the educational value of sloyd was recognized, and in consequence the Swedish government introduced sloyd into the public schools as "a system of educational manual-training in which wood is the material employed." The term has still further changed its meaning, for in the Swedish exhibit of sloyd in the St. Louis Exposition of 1904, cardboard and metal-working was exhibited. The Nääs school now is a government institution, the *Slöjdlärareseminarium*, which should be translated simply *Manual-Training College*. When sloyd was introduced to America in 1886, we were still partly under the influence of the Russian idea of manual training, which emphasized the analysis of constructive manual processes into successive steps, each of which was more or less distinct and separate, so that attention and interest were turned rather to the making than to the thing made Sloyd, on the other hand, had come to emphasize the appeal to the creative and esthetic impulses, through the selection of simple objects to be made, which should be of use to the maker or to his friends. This utility was intended to awaken interest in the object made and to furnish a test by which the child making it could judge of its perfection. Further, the sloyd system graded the exercises according to the development of the mind and body of the child, and not according to the order which prevails in training an apprentice whose powers already are developed in larger measure. The Russian system dealt largely with straight lines, especially in the elementary steps; but sloyd, by using the knife as the fundamental tool, was able to begin with curves and with carved work. Sloyd-instruction was individual. In drawing it insisted on drawing from objects rather than from plane-copies. It was adopted in Springfield, Mass., in 1886, in the New York schools in 1888. The Sloyd Training-School was started at Boston as a private institution in the latter year. Until 1896 sloyd was discussed at most meetings of the National Educational Association. A good series of models and outlines of sloyd courses is given in the proceedings of the N. E. A. for 1894, pp. 267-8. But, later, it was apparent that the American idea of manual training so naturally leads to the adoption of the sloyd principles that there was no reason to speak of it as a separate system. As above pointed out, the sloyd methods have also been so modified as to approximate the broader system of manual training which now prevails in this country. The influence of the sloyd movement was undoubtedly needed at the time it was felt. See MANUAL TRAINING.

Slug, a land-snail of elongated form, with a small rudimentary shell, either covering the lungs and heart or entirely absent. These animals have feelers with eyes at the extremities, as in the common snail, but the body is not coiled. The shell when present is a small flattened plate usually concealed in the mantle. Some of the common forms reach in length from two to four inches. They often live in cellars. They live concealed under boards and other objects during the day, but are active at night, feeding mainly on vegetables. In Europe they have caused great injury to garden crops. They hide their eggs cunningly in the roots of plants, in crevices and in protected nooks; they would multiply alarmingly if it were not for bird-enemies and an insect that destroys their eggs. The name is applied also to larvæ, as the rose-slug, the larva of a saw-fly, and to various soft-bodied insects.

Smell, the sense that perceives odors. The nerves of smell are an extension of the brain, and are unaffected by any other sort of impression. From the olfactory lobes of the brain they are distributed to the upper part of the nose. The odorous matter is dissolved in the mucous membrane of

the nasal cavity, and if the odor is to be noticed there must be a passage of air through the nose and the membrane must be moist. If one stops breathing, odors can not be noticed. The delicacy of this sense is remarkable; for one thirty-three-millionth of a grain of musk can be detected. When an odor acts on a nerve of smell, it first stimulates it; but if the influence continues long, the stimulus ceases and the nerve ceases to distinguish the smell. The strength or sensitiveness of the sense of smell varies with different animals. In some animals, as the dog, it is wonderfully developed, but in man it often demands confirmation from other senses. Flesh-eating animals are more sensitive to the odor of other animals than are animals that live on vegetation; and these are more sensitive than those to the odor of plants. Only gaseous or vaporous odors are recognized. Some people are so sensitive to odors that roses, new-mown hay or goldenrod inflames the passages of the throat, nose and eyes, causing rose-fever or hay-fever.

Smelt, a small fish closely related to the salmon, but usually placed in a distinct family. On the American Atlantic coast two species, one more northern than the other, extend from the Arctic to Virginia. They are each about 12 inches long and silvery in color. When fresh, they have an odor resembling cucumbers and are highly prized as food. Other similar forms occur in Europe and along the Pacific coast of the United States.

Smiles, Samuel, a Scottish writer, was born at Haddington in 1812. He studied medicine at Edinburgh and practiced at Haddington and at Leeds, finally becoming editor of the Leeds *Times*. Here he met George Stephenson, which led to writing his life in 1857. His book, *Self-Help*, followed, and at once was a success, which has continued, the sales reaching 150,000 copies and the translations being made in 17 languages. Some of his other works are *Character*, *Thrift*, *Duty*, *Lives of the Engineers*, *Men of Invention*, *The Huguenots in France*, *The Huguenots in England* and *Industrial Biography*. He died at London on April 17, 1904.

Smith, Adam, a Scottish philosopher, was born at Kirkcaldy in Fifeshire, on June 5, 1723. He studied at Glasgow and at Oxford, and was made professor in the University of Glasgow. He published his *Theory of Moral Sentiments* in 1759 and, later, a *Dissertation on the Origin of Languages*, both of which had great vogue in their day. But the work which gives him his reputation and makes him the founder of the science of political economy was his *Inquiry into the Nature and Causes of the Wealth of Nations*, published in 1776. Its clear style, startling doctrines and curious facts made it popular at first; but, when it was seen how contrary its principles were to the old ideas of things, it was vigorously opposed. After the French Revolution and the excitement attending it had passed by, the book became the leader of a great host of literary works based upon it. Smith became lord-rector of Glasgow university in 1787, and died at Edinburgh, July 17, 1790. Consult Farrer's *Life* in the English Philosophers Series and Haldane's in the Great Writers Series.

Smith College, at Northampton, Mass., was founded in 1871 by Miss Sophia Smith, of Hatfield, Mass., who donated about $365,000 for the purpose. It is a college for women, providing courses of study and facilities for education equal to those which are afforded in the best colleges for young men. It stands in the first rank among colleges for women. It has a faculty of 102 and an attendance of 1,477 students, with a library of 7,000 volumes.

Smith, Edmund Kirby, a Confederate general, was born at St. Augustine, Fla., in 1824. He was professor at West Point and a major in the United States army. In the Confederate service he became lieutenant-general in 1862 and general in 1864. He was made commander of the trans-Mississippi department in 1863, and so managed it as to make it self-supporting. He invested Cincinnati in the autumn of 1863, but withdrew when the veterans under Sigel entered the city. At the close of the war his forces were the last to surrender. He was president of the Atlantic and Pacific Telegraph Company from 1866 to 1868, chancellor of the University of Nashville from 1870 to 1875, and afterwards professor in the University of the South at Suwanee, Tenn. He died there on March 28, 1893.

Smith, Francis Hopkinson, American artist and author, was born at Baltimore, Md., Oct. 23, 1838, and as a youth studied, and for some years was actively engaged in, mechanical engineering. In the latter capacity he performed considerable work under contract for the United States government. He has, however, made his chief reputation as a water-color painter, among his more notable pictures being *In Darlink Wood*, *In the North Woods* and *A January Thaw*. In literature he has also achieved a reputation, as well as an illustrator. Among his works are *Old Lines in New Black and White; A White Umbrella in Mexico; Colonel Carter of Cartersville; American Illustrators; Venice; Gondola Days;* and many more.

Smith, Gold'win, an English scholar and writer, was born at Reading, Aug. 13, 1823. He studied at Eton and Oxford and was elected a fellow of University College. From 1858 to 1866 he was professor of history at Oxford. During the Civil War in the United States he wrote pamphlets in support of

the north, and in 1864 lectured in the United States. He was appointed professor of English and constitutional history at Cornell University in 1868. Since 1871 he has lived in Canada, where he edited the *Canadian Monthly* and founded and edited *The Week* and *The Bystander*. His writings, which are marked by vigorous thought, incisive and brilliant style, remarkable powers of compressing much into little space, great lucidity and high interest, embrace *Irish History; Lectures on the Study of History; Three English Statesmen; The United States* (1492–1871); *The United Kingdom;* biographies of *Garrison, Cowper* and *Jane Austen;* and numerous other works.

GOLDWIN SMITH

Smith, Henry Boynton, an American theologian, was born at Portland, Me., in 1815. He studied at Halle and at Berlin, Germany, after finishing his theological studies at Andover and at Bangor. He was a professor of philosophy at Amherst College, and of church-history and, later, of theology at Union Theological Seminary in New York City. He held this position 20 years, which, with translations of works on church-history, made him one of the first theologians of the Presbyterian church. He died at New York, Feb. 7, 1877.

Smith, Captain **John,** the founder of Virginia, was born in Lincolnshire, England, in 1580. He traveled in France and the Low Countries, and, when on his way to join the Christian army fighting against the Turks in Hungary, was robbed by four adventurers. He joined a ship, half merchant and half pirate, and helped to capture a Venetian argosy. He distinguished himself in the service of Ferdinand, Duke of Austria; was next sold as a slave; but escaped and traveled through Germany, France, Spain and Morocco. In 1605 he joined an expedition of three vessels and 105 men, to found a colony in Virginia. On the way out he was accused, by the leaders, of a conspiracy to make himself king of Virginia and was kept a prisoner on the voyage. Jamestown was founded on James River in April, 1607. Smith, after being tried and acquitted, was made a member of the council, and was the real head of the colony, saving it from destruction. On one of his journeys into the country for corn he was captured by the Indians under Powhatan, their chief, and his life saved by Pocahontas, the chief's daughter. The story, however, has been doubted by late writers. On his return to Jamestown he found the colony reduced to about 40 men, who were anxious to return to England, but were induced by Smith to remain until others arrived. He explored Chesapeake Bay in two voyages, traveling about 3,000 miles and making a map of the country. He was superseded in 1609 as governor by Lord Delaware, and returned to England. In 1614 he explored the coasts of New England, making a map of the country, which he presented to Prince Charles. He undertook the founding of a colony in New England in 1615, but his vessel was captured by a French war-ship, and he was carried to La Rochelle. After his escape he wrote an account of his voyages to New England. He also wrote *General Historie of Virginia, New England and the Summer Isles* and the *True Travels, Adventures and Observations of Captain John Smith.* Consult *Life* in Sparks' "American Biography." He died at London, June 21, 1631. See POCAHONTAS.

Smith, Joseph, Jr. See MORMONS.

Smith, Samuel Francis, an American clergyman, was born at Boston, Mass., in 1808. He served as pastor of Baptist churches in Waterville, Me., Newton and Boston, Mass., and edited *The Christian Review* and other Baptist periodicals. He is known as the author of several hymns, but especially of the national hymn, *My Country 'tis of Thee,* which he wrote in 1832, while a theological student at Andover. A Baptist hymn-book contains 27 of his hymns. He died on Nov. 16, 1895. Dr. Holmes said of him: "Fate tried to conceal him by naming him Smith, but he shouted a song: *My Country, of Thee.*"

Smith, Syd'ney, an English author, was born at Woodford, Essex, June 3, 1771. He studied at Oxford and was curate at Netheravon where he became tutor to a young man intending to study in Germany, but the war prevented and sent them to Edinburgh. Here, in 1802, with Jeffrey, Horner and Brougham he started *The Edinburgh Review,* writing 18 articles in the first four numbers. He next lived six years in London, where he made his mark as a lecturer on philosophy, a preacher and a brilliant talker. He was made rector of Combe Florey in Somerset and a prebendary at St. Paul's, London. He wrote 65 articles for *The Edinburgh Review; Peter Plymley's Letters* in favor of Catholic emancipation; and letters and pamphlets on the ballot, the game-laws, prison abuses etc. He is best known, however, as a wit and the creator of "Mrs. Partington." He died on Feb. 22, 1845. See *Life* by Holland and Reid's *Times of Sydney Smith.*

Smith, Sir **William,** an English classical scholar and for many years editor of *The*

London Quarterly Review, was born at London in 1812 and died on Oct. 7, 1893. His name will be familiar to most students by his many compilations — chiefly by his *Dictionary of Greek and Roman Antiquities; Dictionary of Greek and Roman Biography and Mythology; Greek and Roman Geography; Latin-English Dictionary; Dictionary of the Bible; Dictionary of Christian Biography;* and *Dictionary of Christian Antiquities.*

Smith, William Robertson, a distinguished Scottish divine, biblical scholar and orientalist, was born at Keig, Aberdeenshire, Nov. 8, 1846, and died at Cambridge, England, March 31, 1894. Educated at Aberdeen University, he studied theology at Edinburgh, at Bonn and Göttingen, and was elected to the chair of Hebrew and Old Testament exegesis at the Free Church College, Aberdeen. While here, he contributed articles of an advanced character on the Bible for the *Encyclopædia Britannica* adverse to the "standards" of the Free Church, which provoked much controversy and led to a prosecution for heresy. Owing to a skillful and powerful defense and to the spread of broader views of biblical criticism and of the latitude allowed a writer on questions of interpretation, the trial was inconclusive, though subsequently (in 1881) he was removed from his chair, but left with its emoluments. This occurred in consequence of Professor Smith's later articles for the *Britannica* on the Hebrew language and literature. During his suspension he traveled in Egypt and Arabia, and on his return he became associated with Prof. T. Spencer Baynes in the editorship of the *Britannica.* In 1883 he became lecturer on Arabic at Cambridge and subsequently professor at that university. The works of this fearless investigator and writer embrace *The Old Testament in the Jewish Church, The Prophets of Israel, The Religion of the Semites, Fundamental Institutions, Kinship and Marriage in Early Arabia* and *Isaiah* for Professor Perowne's *Cambridge Bible for Schools.*

WILLIAM ROBERTSON SMITH

Smith, Sir **Will'iam Sid'ney,** the hero of Acre, was born at Westminster, England, July 21, 1764. He entered the navy at 11, and was made lieutenant when only 16 for his courage at Cape St. Vincent. From Constantinople in 1798, learning that Bonaparte was about to attack St. Jean D'Acre, Syria, he hastened there in command of a squadron. He captured the enemy's vessels in March, 1799, and held the town until Napoleon raised the siege, leaving his guns behind. His death occurred at Paris, May 26, 1840. See *Life* by Barrow.

Smith'field or **Smooth'field,** is an open space of nearly six acres in London, England, and has for centuries been used as a market for sheep, horses, cattle and hay. It was outside the city-walls, and could be used for jousts, tournaments and executions. The well-known Bartholomew fair was held here; Wallace the noble Scotch patriot was executed here by Edward I; Wat Tyler, with 30,000 peasants, here met Richard II and was stabbed by the mayor of London. It is best known, however, as the place of execution of the long line of English martyrs from 1401 to 1612. The cattle-market, well-described in *Oliver Twist*, was closed in 1855. The hay-market still occupies part of the space, but the center is laid out as a garden with fountains.

Smithso'nian Institu'tion, a scientific establishment, which was organized by Congress in 1846 to carry into effect the will of James Smithson, an Englishman, born in 1765, who devoted his life to scientific pursuits and bequeathed his estate of $515,169 to the United States, to found "at Washington an establishment for the increase and diffusion of knowledge." The original bequest has, through subsequent additions, reached the amount of $900,000, to the interest upon which Congress adds an annual appropriation of about $20,000. The institution is governed by a board of regents appointed by the government. It has large and beautiful buildings, filled mainly with the national collections. The principal work of the institution is in the direction of original research, Professor Henry, the first secretary, making the rule that nothing should be undertaken by it which could be done as well somewhere else. Its library of 100,000 volumes has been united with that of Congress, and its art-collection was transferred to Corcoran Art-Gallery. In its buildings are the national museum, a bureau of ethnology and a bureau of international exchange; and connected with it are a national park and an observatory. It publishes *Smithsonian Contributions to Knowledge, Miscellaneous Collections* and an annual report. It carries on communication between the library and scientific associations in Europe and America, and has a vast correspondence with all parts of the world.

Smoke, the vapor produced by burning any substance, usually wood or coal. The smoke from burning wood is almost colorless, and consists mainly of carbonic acid and water, while that from burning bituminous coal is darker, being mixed with an oily vapor and soot or finely divided carbon. The more perfect the combustion, the less smoke; and the great effort in large

cities to remove the smoky atmosphere which results from the large amount of smoke coming from factories, foundries and innumerable fires is mainly in the direction of perfecting the combustion of the coal used. If coal is heated in a close vessel, the oil, tar and gas formed in the combustion are all driven off consumed, leaving a coke which burns with a smokeless flame, as does also anthracite, which has lost the original volatile matter of the coal by natural processes.

Smoll'ett, Tobias George, a Scotch historian and novelist, was born at Dalquhurn, in 1721. He studied medicine and served an apprenticeship with a doctor and apothecary, afterwards obtaining a medical degree. He went to London in 1739 and attempted to stage his tragedy of *The Regicide*, but failed, and went as surgeon's mate on *The Cumberland*, which took part in the expedition to Carthagena in 1741. Both these experiences he describes in *Roderick Random.* His first publication was *Advice, a Satire*, in 1746. *Roderick Random* appeared in 1748 without his name, and was a great success, as was also the *Adventures of Peregrine Pickle* in 1751. His *History of England* from the invasion of Julius Cæsar to 1748 was begun in 1756, four volumes being written in 14 months. The continuation of the history, bringing it down to 1764, is better known than the first part, forming the continuation of Hume's history. His *Travels through France and Italy* were written after a two years' sojourn on the Continent. In Monte Novo near Leghorn, Italy, where he had gone for his health, Smollett wrote his last and best novel, *Humphrey Clinker*, which was published in 1771. He lived only long enough to hear the first rumors of its success, dying on Oct. 21, 1771. See Hannay's *Life* in the Great Writers Series.

Smug'gling is bringing goods liable to duty into a country without payment of the government dues; it also is the evasion of taxes on goods by illegal or secret manufacture. Smuggling was carried on largely in early times in England and on the Continent, and the stories of the adventures of those engaged in it form a large part of old romances, as in Scott's *Guy Mannering* and *Redgauntlet*. Tea, brandy, silks and tobacco were the articles brought into England by smuggling, at one period half the silks sold paying no duty and three fourths of the tobacco used in Ireland escaping the tax. The introduction of free trade in England made the business unprofitable. The enormous coast of the United States makes the evasion of custom-duties easy, and the long frontier on Canada and Mexico also offers opportunities of introducing contraband goods; but smuggling is carried on largely through the regular channels of trade and under the eyes of the custom-house inspectors, in spite of very careful watching The schemes for carrying it on are innumerable, women being especially skillful in their evasions. Goods are concealed about the person, as in the hair and in false calves on the legs, in canes and secret pockets and quilted into skirts or vests. Seizures of large amounts are often made, but the hope of success and the profits of one successful venture keep up the practice. The illegal manufacture of spirits has been carried on mainly in the mountainous districts of the south, and the adventures of the revenue-officers in those regions afford considerable material for romance.

Smut (in plants), a common disease of the grains of many cereals, as corn, rye etc., caused by the presence of a parasitic fungus. See Æcidiomycetes.

Smyrna (*smēr'nä*), an important seaport in Asiatic Turkey, at the head of the Gulf of Smyrna. The gulf runs inland from the Ægean Sea for 46 miles. The city climbs up the slopes and nestles at the foot of a steep hill, on the summit of which are the ruins of the ancient Greek Acropolis. Its population of 201,000 contains a large Turkish element, though numerous other races are represented. It has manufactures of carpets, cotton and woolen goods, pottery, iron-foundries and machine-shops. Its importance, however, is from its commerce, as it has the largest part of the trade of Asia Minor with Europe. It exports raisins, figs, opium, carpets, sponges, licorice, olive-oil, tobacco, walnut-wood, emery and poppy-seed; and imports cloths, timber, iron, butter, cheese, petroleum, glass and paper. There is a fine harbor, which is entered annually by over 1,600 vessels. Smyrna, originally peopled by Greek immigrants to Asia Minor, became Ionian before 688 B. C., and was one of the great trading-places of the east. The king of Lydia destroyed it in 630 B. C., and it was more than 300 years before it was rebuilt on a new site. Under the Romans it regained its importance, though rivaled by Byzantium, to whose emperors it belonged. Destroyed by Tamerlane in 1402, it was captured by the Turks in 1424.

Snail, a shelled mollusk belonging to the class *Gasteropoda*. The land-snails are widely distributed and well-known. They are air-breathers, and, feeding upon vegetation, do much injury in gardens. The animal is spirally coiled to fit into its shell. The lower part of the body, called the foot, can be protruded. There are four tentacles or feelers on tne head, which can be shortened or extended at will. The longest pair have eyes in their tips. There are slender muscles attached to the apex of the shell and to the animal's foot, by means of which the animal is drawn into its shell. In dry weather or in winter the opening is often

closed by a horny structure, called the *operculum*. There are an immense number of land-snails in tropical countries, of considerable size and bright colors. Some are tree-climbers and secrete a thread of mucous substance, by means of which the body is suspended like that of a spider by its thread. They are eaten as food, especially in Europe. There also are water-snails, some of which come to the surface to breathe air, while others are provided with gills. The common garden-snail has 135 rows of 105 teeth each, making 14,175 in all.

Snake River, the largest branch of the Columbia. It rises among the Rocky Mountains near Wyoming, and in crossing southern Idaho forms Shoshone Falls, and is a part of the northern boundary of Idaho. In southern Washington, as Lewis River, it joins the Columbia, having made a journey of 1,050 miles. It is navigable for only 160 miles.

Snakes, the largest class of reptiles, the representatives having an elongated body covered with scales. They have no limbs and no rudimentary bones representing the shoulder-arch, but there is a trace of the arch of the hind limbs. They move by pushing the edges of the ventral scales against roughnesses, but can make no headway on a smooth surface. The bones of the skull and jaws are movable, so that the latter can be put on a stretch, which enables the snake to swallow animals larger than the normal size of the mouth and throat. Some possess poison-fangs with which their prey is killed, while others coil around their prey and crush it. They shed their skins periodically, and the deserted skins are often seen in fields and woods. Some live entirely on land, though most snakes swim well, others climb trees, and in the Indian Ocean are snakes living habitually in the water. Most of them lay eggs, but a few, including the last-mentioned ones, bring forth their young alive. The snakes naturally fall into two groups — the nonpoisonous and the poisonous ones. There are about 700 species of nonpoisonous or colubrine snakes, which are found in nearly all parts of the world. They are well-represented in the United States, and include such familiar forms as garter-snakes, blue racers, grass-snakes and blow-adders, all of which are harmless. The venomous snakes are represented in the United States by the rattlesnake family. There are about 60 species in this family, all American and renowned for their venom. Besides rattlers are included the copperhead and water-moccasin, the latter being the most dangerous of our snakes. The anacondas, boas and the like are powerful nonpoisonous snakes. All snakes are more abundant in warm and tropical countries. India is noted for venomous snakes, like the cobra, and the annual number of deaths from snake-bites there reaches nearly 25,000. See Boa, Cobra, Copperhead, Moccasin and Rattlesnake.

Snipe, a common name for a number of favorite game-birds belonging to a group of

SNIPE

shore-birds. They grade into the sandpipers. There are about 100 species, and 30 of these visit the United States mainly during migration. A number of snipes, however, nest within the United States. Among the more widely known forms are the woodcock, jack-snipe, tip-up and Wilson's snipe. The jack-snipe is the pectoral sandpiper, and the tip-up the spotted sandpiper. The American woodcock is about 11 inches long, and variegated with black, brown, gray and russet colors. The European woodcock is similar, but considerably larger. The American bird frequents low, wet woods and in the autumn visits corn-fields and wooded hillsides. They probe for earthworms with their long bills, making holes in clusters. Wilson's snipe is about 11 and one fourth inches long, and is a favorite game-bird. It lives in fresh-water marshes and meadows. The tip-up or teter snipe is about seven and one half inches long, and has a white breast spotted with black. The jack-snipe is abundant during migrations. Snipes also abound in the Old World.

Snow is water floating in the atmosphere in a crystallized state. When a cloud of water-vapor reaches a temperature below 0° C., the process of freezing begins; and, if the air be calm, the crystals thus formed are large and regular. They are most easily observed by collecting them on a piece of black velvet and examining them with a lens. In the accompanying figure are shown the forms of some typical crystals, recently prepared from microphotographs by the United States Weather-Bureau. The whiteness of snow results from the total reflection of light, which occurs, sooner or later, when a ray of light enters any considerable body of snow from any direction. By the *snow-line*, sometimes called limit of per-

petual snow, is meant the height above the sea at which snow does not melt, even in the hottest summers. This elevation varies greatly with latitude and with local circumstances. In general it diminishes with the latitude. The lower the latitude, the higher the snow-line. Snow does not, however, collect to an indefinitely great depth, even in regions which lie entirely above the snow-line; for the pressure soon reaches a point where the snow is compressed into ice and flows off as a glacier. Consult Tyndall's

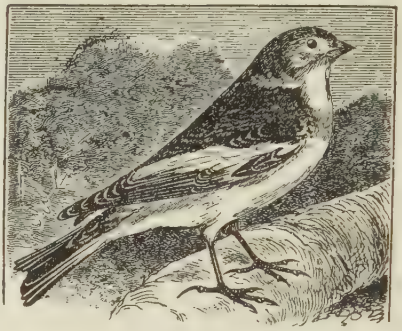
Forms of Water (International Scientific Series.)

Snow'berry, a common shrub, native of North America, belonging to the honeysuckle family. It receives its name from its white, waxy berries, which remain on the bush after the leaves have fallen and make it an ornamental shrub.

Snow'bird or **Jun'co,** a sparrow-like bird very common in the United States during winter. They are about six and one half inches long, with the upper parts slate-gray and the lower parts whitish. They are often seen in flocks of ten to 50 on the ground near evergreens. They nest north of New England.

Snow-Bound, a poem by Whittier, was written, as he said, "to beguile the weariness of the sick-chamber." It was published in 1866. It is the best idyl of American rural life, delicate, spontaneous and true to nature and life. It pictures an old-fashioned American farm-home, simple, frugal and devout. A warmth of affectionate memory and religious faith permeates it; the lines on the death of the poet's sister are superb in beauty and pathos. The incidents of household-life and the unity and interdependence of a New England rural family in winter are so skillfully portrayed as to rank the poem with *The Cottar's Saturday Night* and *The Deserted Village.*

Snow'bunt'ing or **Snow'flake,** a bird about seven inches long, nesting in the far north and, in winter, visiting the United States as far south as Ohio River. In the breeding-season they are pure white, with black on their wings and tail and black feet and bill. The winter-plumage changes, and the white on the body is clouded with clear, warm brown, and the bill becomes pale. They appear in flocks on the ground



SNOWBUNTING

and perch on fences, but rarely on trees. With the snow-birds they belong to the finch family.

Snow'drop, a class of plants of the same order as the amaryllis. It is a spring-flower, with a white, drooping bell which gives its name, from its resemblance to a lady's earrings, or drops, as they were called in the 16th century. The root — a bulb — has two or three narrow leaves and a long stem with a single flower.

Snow'shoes, very broad, flat shoes, used in cold countries for walking on snow. The broad surface keeps the foot from sinking into the snow. The snowshoe worn in Canada is shaped somewhat like a tennis-racket, with a short handle, and is from three to five feet long and from one to two wide. It is a wooden frame with a leather covering, upon which the foot is fastened by thongs. The Norwegian snow-shoe, called *ski*, is a wooden runner, about four inches wide and eight feet long, turning up in front.

Soap is a compound of soda or potash and fat, potash making a soft soap and soda a hard soap. The principal fats used are tallow, lard, olive-oil and cocoanut-oil for hard soaps; besides these, linseed-oil, fish-oil and castor-oil are used in soft soaps. The distinctive property of soap is its power of cleansing, though to what it owes this power has never been decided. It will dissolve in water and in alcohol, and, when shaken in water forms a foam or lather. Soap is made by boiling the fat or oil with a solution of soda or potash, the length of time and the strength of the solution or lye varying with the kind of soap. Yellow soap usually contains rosin. Toilet-soaps are made of good yellow or curd soap, the finest being subjected to a process called milling. The soap is cut into shavings, dried a little, coloring matter and perfumes added, and then passed between granite rollers and afterward pressed into bars, from which the cakes are cut and stamped.

Transparent soaps are made by dissolving common soap in alcohol, pouring off the solution and getting rid of the most of the alcohol by distillation. Soap improves with age, growing harder and dissolving more slowly.

Soapstone. See TALC.

Sobieski, John. See JOHN III OF POLAND.

So'cialism is the theory that society should be reconstructed. The state, it holds, should own all property except wages, clothing, food, fuel and homes; direct if not operate all industries; and distribute the profits to all citizens. Socialism is neither communism nor anarchy, and does not oppose religion or the family, though many socialists do. It originated in 1808, its founders being Fourier and Saint-Simon in France, Robert Owen in England (1817) and Lassalle and Marx (1867) in Germany. The socialist movements of Saint-Simon, Owen and Blanc collapsed in 1848, but "Christian socialism" then originated in England with Maurice, Ludlow and Kingsley, the famous author of *Yeast*. Lassalle (1863) founded democratic socialism, called social democracy, and Marx created modern socialism. Though this now differs as to details and methods from his extreme views, it agrees on the whole with his principles, which are these:

Land and capital are the sources of subsistence and instruments of production. Labor gives them value. They should belong, not to individuals, but to society. Capitalists, people who possess wealth but do not labor, own land and capital and hire labor. The laborer must live. He has only his labor to sell for his support. So he is not free, really, but a kind of slave. Capitalists pay only enough to support him and his family, the future laborers, but take the value that he gives to property and products. This value belongs to the laborer, and should be paid to him. The state, therefore, ought to manage all industries and distribute their profits. Socialism claims that when this is done, society will be perfect, prosperity permanent and universal.

Socialism is gaining ground in Europe and Australasia. It aims to gain control of of all governments by peaceful political action.

Social' Set'tlements. A social settlement is a group of people who have what is commonly called education and social training living among those who through poverty have less of those things, for the purpose of learning from them and of them, while teaching and helping in whatever way is possible. The benefits thus conferred on each class should also lead to the breaking down of class-distinctions. Inspired by Kingsley, Maurice and Ruskin, Arnold Toynbee, a tutor of Oxford University, in 1875 founded in Whitechapel, London, the first settlement. After a few years he died, but in 1884 Toynbee Hall was established in that part of London, where he had worked. In 1887 Stanton Coit, who had written *The Neighborhood Guild*, founded a club of that name in New York City, which embodied Toynbee's plans. In 1889 Hull House, the most famous of our social settlements, was established in Chicago under the direction of Jane Addams and Ellen C. Starr. Since then the movement has spread to all the chief cities of this country. In 1907 two splendidly equipped buildings were dedicated to this purpose: University House in Philadelphia and Pillsbury Building in Minneapolis, bearing witness to the continued life of the idea. There were, in 1905, more than 115 settlements in the United States, of which 30 were in New York City, 15 in Chicago, 14 in Boston and 5 in Philadelphia. About 100,000 people were connected in some way with the work of these settlements, and nearly that number were registered in the various classes conducted by them. In England there were 14 settlements in London conducted by and for men and the same number for the benefit of women. There were about 50 in Great Britain. There are a few settlements on the European Continent and in the colonies. The largest settlements are University Settlement in New York with 10,000 attending; Hull House with 6,000; and Kingsley House in Pittsburg with 6,000. In America the activity of the women in this work is very marked; in England the university men have led the way, but recently university women have done much work. In both countries it is chiefly college students or graduates who engage in settlement work.

The work centers around the persons of the few who reside in the settlement. There always are many nonresident helpers. The residents usually pay all their own expenses, except in the case of one or two officers. The residents visit their neighbors, and help with comfort and advice, but do not give money, as a rule. In the evening men and women gather in the reading and smoking parlors, and amuse themselves in various ways. Debating and dramatic clubs are popular. Of importance are the organizations conducted by the members. So far as possible in the best settlements the management is given over to such organizations, who have to settle many problems in their business meetings. Gymnastics and athletic clubs are popular, and sometimes dancing associations among the women. There are many lecture-courses and musical entertainments. Evening classes in which courses of study may be steadily pursued are also offered. Special features distinguish some settlements.

For example, dispensaries, employment bureaus and legal aid societies. Special investigations have been conducted, particularly in connection with Hull House; for example, as to the cause of an epidemic disease; and the results have proved of much value. In this work the association with university courses in sociology is often of service. The settlements have assisted the juvenile courts now being established throughout the country. In all things the atmosphere of brotherhood and democracy is to displace the spirit of envy, contempt and condescension and fear which class-distinctions tend to cause. See Emil Muensterberg, in *Charities and Commons*, Sept. 14, 1907.

Soci'ety Islands, a group in Oceania or the eastern Pacific Ocean, lying to the south of the Hawaiian group, divided into several groups, the Tahiti Islands and Society Islands proper being the chief, with the Marquesas Islands, the Leeward Islands, the Tuamotu and other groups. The Tahiti and adjoining groups belong to the French and consist of a number of islands. They are of volcanic origin and mountainous, the loftiest point on Tahiti being 7,339 feet high. These islands are governed by a French administrative council Their area is 1,520 square miles and their population about 29,000, mostly Polynesians — all forming a homogeneous colony. They have a healthful and mild climate and fertile soil, producing the guava, breadfruit, oranges, lemons and other tropical fruits. The chief industries are the preparation of copra, sugar and rum, which, with vanilla and mother-of-pearl, form the chief exports. Pigs, dogs and rats were the only animals found on the islands when discovered, but all domestic animals have since been introduced. The Spanish and English both claim the discovery of the islands, Captain Cook in 1760 giving them their name. Through the labors of English missionaries the islands, then under Queen Pomare, were Christianized in 1815. The efforts of French Roman Catholic priests to enter the country brought on a dispute with England and the final establishment of the French authority on Tahiti. Steamers connect the islands with San Francisco and New Zealand. Consult Hort's *Tahiti* and Gaffarel's *Les Colonies Francaises.*

So'ciol'ogy. The first writer to attempt a special differentiation of this science was the French philosopher, Comte (1789–1857). He conceived that the phenomena of social intercourse are subject to natural laws as definite and unvarying as those of physics or physiology. The study of these laws, or sociology, he regarded as the goal of scientific research. All sciences exist to prepare the way for the sociologist. Biology, the science of life, is the study upon which sociology, in his view, is most immediately dependent. Comte (*q. v.*) hoped from this new science to discover the principles that should be employed in regenerating society. Theoretical study thus led to immediate practice in a utopian scheme of social life. Herbert Spencer (1820–1903), the English philosopher, did much toward making sociology a science. With him the biological conception is dominant, and his two leading principles are that of evolution (*q. v.*) and the notion that society is an organism, the evolution of which involves the progressive differentiation of organs and functions and their integration into a harmonious system. Bastian, the German ethnologist, endeavored to found sociology upon psychology. He studied the effect of external conditions upon the mind, and from these effects deduced the explanation of the social relations devised by the intelligence of man.

In recent times sociology has developed into a recognized science with regular departments in many universities. It may be divided into pure and applied sociology. Pure sociology considers the general laws governing the genesis and evolution of society and the effect of social intercourse upon the character of the individual. It is especially dependent upon history, anthropology and statistics for its facts and upon psychology for its explanations. From history, political science and economics it gets an account of the institutional and industrial relations that prevail and have prevailed since civilization became well-established. From anthropology it gets an account of the social traits of primitive men and of the beginning of morality, law, religion, the arts and institutions, the family, the state and social orders. From psychology it gets the laws of social suggestion, imitation and the effects of these on different temperaments. The most important authorities on imitation are Tarde, the French writer, and J. M. Baldwin, the American psychologist. Tarde regards all social intercourse as based primarily upon imitation. Inasmuch, however, as each individual may strive to imitate many models, the result will be a composite in which some models are suppressed and others fused into a new product. Meanwhile the uses of practical life will continually act as a force determining which models shall be preserved and which shall disappear. The social mind is a product of certain inherent powers stirred into life and molded by the influence of imitation. Baldwin especially shows how the intellectual and moral life of the individual is awakened and given content by this activity. Le Bon, a French writer, sets forth the peculiar laws that govern the action of the individual when in a crowd and the effect of social characteristics upon the operation of such

social forces as imitation and suggestion. Prominent present-day sociologists, while attaching great importance to imitation, do not by any means make it account for all social phenomena.

Applied sociology does not to-day concern itself so much with an attempt at an utopian reconstruction of society as with the best policy in dealing with those in whose affairs society, either for its own good or for philanthropic reasons, feels called upon to interfere. Both criminology and philanthropy are becoming important specialized sciences, and a distinct School of Philanthropy now exists in New York City. Consult Giddings's *Elements of Sociology* and Henderson's *Dependents, Defectives and Delinquents.*

Socrates (*sŏk'rā-tēz*), a Greek philosopher, was probably born in 469 B. C., near Athens. His father was a sculptor, and he is said to have been trained in the same art, and a statue of the Graces at the entrance to the Acropolis was thought to be his work. He served in the army in three campaigns, where his bravery and endurance were praised by his friends. In 406 B. C. he was a member of the senate of 500, and refused, at risk to himself, to put an illegal question to vote. He was short and odd-looking, with a flat nose, thick lips and prominent eyes. He practiced plain living and trained himself to be indifferent to heat and cold, going barefoot and wearing the same clothing the year round. Xantippe, his wife, has been pictured as a scold, and he professed that he married her as a means of discipline. But a reformer is not always the most pleasant companion and the habits of Socrates must have been at least somewhat trying to an orderly woman.

In middle life he devoted himself to the career that has made his name forever famous. He established no school and did not call himself a teacher, but frequented the public walks, the gymnasia for bodily training, the schools and the market places, talking with any one that addressed him, in the hearing of the bystanders. He had, strictly, no disciples, though some persons made a habit of being present at his conversations. As Socrates left no writings, it is from Xenophon and Plato, two of these friends and listeners, that we have the accounts of his teachings, though in Plato's writings it is difficult to tell what part of the reported conversations are the words of Socrates and what part Plato himself put into his mouth. Socrates believed that he had a special religious mission, having learned from the Delphic oracle that there was no wiser man than himself and interpreting it to mean that the highest wisdom was to be conscious of ignorance and that it was his duty, by questioning all men, to make them wise by teaching them their ignorance. The subjects of his conversations were human nature, human duties, human relations and human happiness, as being the most practical and necessary to man. Cicero said: "Socrates called down philosophy from the heavens to earth and introduced it into the cities and houses of men." In 399 B. C. an indictment was laid against Socrates "for not worshiping the gods whom the city worships and for introducing new divinities of his own; next, for corrupting the youth." Plato's *Apology* gives the substance of his defense, a vindication of his whole life, but not given in a way to conciliate the jury of over 500 Athenian citizens. The vote of condemnation was carried by a small majority, though the sentence of death by poisoning was passed by 80 more votes, provoked probably by his apparent indifference to their judgment. The execution of the sentence was delayed 30 days. Socrates, refusing to escape as his friends urged him to do, spent his last day in discoursing on the immortality of the soul. In the evening he drank the hemlock, and, still talking to his friends, calmly watched the poison doing its appointed work. "Such was the end," says Phædo, "of our friend, whom I may truly call the wisest, justest and best of all the men I have ever known." Consult Zeller's *History of Greek Philosophy.* See PHILOSOPHY, PLATO and XENOPHON.

So'da is a compound of sodium and oxygen, the oxide of sodium, sometimes called a mineral alkali. With acids it forms what are known as soda-salts. The soda of commerce is one of these salts, a compound of soda and carbonic acid, and is called sodium-carbonate, carbonate of soda or sal-soda. It is in large crystals, which dissolve in water and turn to powder in the air. It is sometimes found as a white powder on the top of the ground on the alkali-plains of the west and also in the nitrate lakes of Hungary and Austria and in springs in Iceland and North America. It is manufactured largely from sea-salt, and has been obtained from the ashes of sea-plants. It is used in washing and in making Soap. The soda used in cooking is usually the bicarbonate of soda. It is prepared by adding carbonic-acid gas to the carbonate of soda in different ways, sometimes making a solution of the soda and saturating it with the gas; or by sending a current of the gas over the crystals of soda; or by a chemical process which takes place when common salt, carbon-dioxide and ammonia are brought together. Caustic soda is made by mixing milk of lime, which is slaked lime stirred up with water, with a solution of carbonate of soda, filtering and evaporating the liquid to dryness. This is used in soap-making and in many chemical industries. There are many other sodium or soda salts, as the sulphate, called Glauber's

salts, the phosphate, the nitrate and sodium-chloride or common salt (*q. v.*).

Sodium (*sō'dĭ-ŭm*) is a metal very much like potassium, of a bluish-white color, and burning with a yellow flame. The compounds of sodium are the only form in which it is found in nature, as borax, soda-felspar and, especially, chloride of sodium, which is common salt.

Sod'om and Gomor'rah, two cities mentioned in the Bible and thought to be on the southern shore of the Dead Sea. The Scripture account represents them as being destroyed by a shower of fire for the great wickedness of these cities, and the popular belief has assumed that the waters of the Dead Sea cover their sites.

Sofia (*sō'fē-yà*), the capital of Bulgaria since 1878, stands in a valley of the Balkans. It has been improved since 1891, the old Turkish city with its tumbledown houses and crooked streets being replaced by new French houses, wide boulevards, fine public buildings and electric lights. Railroads connect it with Vienna, Constantinople and Belgrade. It is the seat of the National University, which supports three faculties of 49 professors and lecturers and has about 800 students. The city also has a free library. Its trade is mainly in corn, hides and wheat. Its hot mineral springs have been celebrated for centuries. Sofia was known as *Serdica* by the Romans, and was the seat of a famous council in 343. It belonged to the Bulgarians from the 9th century until 1382, when it was captured by the Turks. In 1878 it was occupied by Russia. Population 82,621.

Soils, the different forms of earth on the surface of the rocks, formed by the breaking down or weathering of rocks. The soils will vary with the minerals in the rocks, the principal ones being quartz, felspar, clays, mica and limestone. When the soil is made from the rocks in their original position, they are called sedimentary; but if formed from rocks above them and carried to them, they are known as transported soils. When the soil is carried by glaciers, it forms drift soils; when carried by running water, it is known as alluvial soil. They are also known as clays, loams etc. Plants also make soil by their decay. So do animals, especially earthworms (*q. v.*) A mixed soil or loam is usually better than a clay or a sandy soil. The plants grown in the soil take from it from 200 to 600 pounds per acre yearly of the minerals found in it, and the passage of water through it also carries away other quantities, so that, where crops are removed, the soil would gradually lose its power of supporting plant life, were it not enriched. This is done naturally by the gradual decomposition of the minerals composing the soil, and also by the artificial process of applying manures and other fertilizers. Another mode of overcoming the difficulty to some extent is by changing the crops grown, as different kinds of crops take up the ingredients of the soil in different proportions. Agricultural scientists are constantly studying soils. See AGRICULTURE, FERTILIZERS, MANURE and NITROGEN-GATHERING CROPS. Consult the Department of Agriculture Experiment-Station's *Bulletin 106*; the Soil-Bureau's *Publications;* the Weather Bureau's *Bulletins 3, 4* and *5*; Fream: *Soils;* King: *The Soil;* Roberts: *Fertility of Land;* and Shaler: *Origin of Soils* (in U. S. Geological Survey's *12th Annual Report*, 1890-1, Vol. One, pp. 213-45).

Sokoto (*sō'kō-tō*) is a Sudanese province of Northern Nigeria in Central Africa. It lies between Bornu on the east, Gandu on the west, Benue River on the south and the Sahara on the north, and has an area of 200,000 square miles and a population of possibly 12,000,000. The Fulahs are the ruling race, the Hausas and other Negro tribes the subject population. The sultan in 1885 put his kingdom under British protection, granted the Niger Company a monopoly of trade, and afterward received a resident. The country is fertile and well-watered, and has extensive deposits of excellent iron. The people are intelligent, industrious and peaceful, good farmers, great traders and manufacturers of iron-work, muslin and shoes. Sokoto the capital is a city of 80,000, and is well-built in the Moorish style.

So'lar Mi'croscope, a modified form of magic-lantern, not much used now that gas-lanterns and electric lanterns have become so easily available. The only essential difference between the solar microscope and the ordinary magic-lantern is that in the former a beam of sunlight, reflected from a heliostat or porti-lumiere, is employed instead of oil, gas or the electric arc for illuminating the slide.

Solar Sys'tem, a term used in astronomy to include the sun, planets, satellites of planets, asteroids and any "captured" bodies, as possibly periodic comets. See ASTEROID, ASTRONOMY, MOON, PLANET and SUN.

Sol'emn League and Covenant, The, was a contract entered into by the General Assembly of the Church of Scotland and the Commissioners from the English Parliament in 1643 to secure uniformity of doctrine, worship and discipline throughout Scotland, England and Ireland "according to the word of God and the example of the best reformed churches." By this agreement the Scotch army came to the aid of Parliament in its war against Charles I. On the other hand, Presbyterianism was introduced into England and Ireland. Royalist successes had made Scotch aid indispensable. So the covenant was signed by members of the House of Commons and

Assembly divines who took oath "to labor for the preservation of reformed religion in the church of Scotland and the reformation of religion in the kingdoms of England and Ireland." It formed a bond of union between England and Scotland during the war, but was abjured in both countries by act of Parliament in 1662.

Soldier's Homes in the U. S. These comprise the National Soldier's Home in Washington, D. C., for the maintenance of discharged soldiers and pensioners of the regular army, where they are lodged, fed and clothed without personal cost, and also if sick, medical attendance. The inmates who to-day number about 1,250, are subject, as army soldiers, to the rules and articles of war. Another institution, similarly conducted and with like object, is the National Home for Disabled Volunteer Soldiers (including sailors), with headquarters at New York City and branches at ten other cities and towns, whose aggregate members cared for number about 30,000. Besides these there are state homes for the same class in about 30 states of the Union, the state and town location of each institution being found in current issues of *The World Almanac* and other year-books.

Solferino (*sŏl'fer-ē'nō*), a village of northern Italy, 19 miles from Mantua. It stands on a hill with a high tower, called The Spy of Italy, from which can be seen the whole plain of Lombardy. It is noted as the scene of the defeat of the Austrian forces by the French and Sardinians, June 24, 1859. The battle lasted 16 hours, the Sardinians being commanded by Victor Emmanuel, the French by Napoleon III and the Austrian forces by Emperor Francis Joseph. The Austrian loss was 20,000, and that of the allied troops 18,000. On June 24, 1870, the bones of the dead were collected in the presence of representatives of France, Italy and Austria, and buried in three great sepulchers. Population 1,350.

Sol'omon, the third king of Israel, the son and successor of David. He reigned 40 years, 993–953 B. C., and was famous for wisdom as well as for his splendid court. His father left a large army and a full treasury, which he used in keeping peace with the neighboring nations and in building fine palaces and the temple, the chief glory of his reign. He extended trade, sending out fleets and caravans which brought back gold, gems and precious woods from Ophir and horses for his chariots from Egypt. His great wealth, however, came from heavy taxation, and he built altars for the idols worshiped by his heathen wives, which caused the nation after his death to revolt against his son and ended in the division of the kingdom. The writings that bear his name are the *Proverbs*, *Ecclesiastes* and the *Song of Songs*, though *Ecclesiastes* probably belongs to a much later period.

Solomon's Seal, a species of plants of the lily-family and related to the asparagus. The plant grows from one to four feet high, with broad green leaves, without stems, and drooping, greenish flowers, followed by small black or blue berries. It is found wild in many parts of North America and in Europe.

So'lon, the ancient Greek lawgiver and one of The Seven Wise Men, was born about 638 B. C. Though tracing his descent from the royal family of Attica, he had to resort to trade to restore the wealth his father had squandered. He was known as a writer of verses, one of his finest elegies having been quoted by Demosthenes and several quotations being found in a work of Aristotle's. The beginning of his political career was the Megarian War. The Athenians had several times failed in their efforts to capture Salamis, and had, on pain of death, forbidden any citizen to renew the attempt. Solon, by feigning madness, aroused the people by his poem, and war was declared, with Solon in command, who succeeded in winning Salamis for Athens. He was made archon or chief ruler in 504, when the country was in danger of a conflict between the nobility and the peasants. The constitution of Athens, such as had never existed before, was the great work of Solon, and made property and not birth the title to citizenship, the aim being to give the lower classes some control of the law. The laws of Draco were repealed except those against murder; no man could be imprisoned for debt; a limit was placed on the ownership of land; and laws against luxury in food and dress were made. These laws, written on pieces of wood, were preserved in the Acropolis and the people bound themselves by oath to observe them for ten years. Solon traveled then in Cyprus, Asia Minor and Egypt, meeting Crœsus, king of Lydia, whom he offended by his answer to his question "Who was the happiest man in the world?" Solon replied that it was Tellos, an Athenian who had died for his country. Crœsus asked the question again, thinking to hear his own name in answer as the possessor of great wealth, but Solon gave the place to two Argive youths whom the gods permitted to die in their sleep as a reward for an act of kindness. (See CRŒSUS). His last years were passed at Athens, where he unsuccessfully opposed the usurpation of Pisistratus, his kinsman. He died about 558 B. C., leaving a command that his ashes be scattered over the "lovely isle" of Salamis. Consult *Histories of Greece* by Grote, Curtius and Cox.

Sol'way Firth is an inlet of the Irish Sea, lying between England and Scotland. It is 36 miles long and receives the waters of the Derwent and Eden on the English side and of the Esk, Dee and Annan on

the Scottish side. Near Annan the Firth is crossed by a railway bridge 5,880 feet long, which, built in 1866–69, was almost destroyed by floating ice in 1881. The scenery of the region is painted by Scott in *Redgauntlet* and *Guy Mannering*.

Solyman (*sŏl'ĭ-man*) or **Suleiman** (*sōō'lâ-män'*) **I,** called The Magnificent, was the greatest of the Turkish sultans. He was born in 1490, and succeeded Selim I, his father. He made many reforms in the internal government of his empire and was known as a patron of learning and of arts. Abroad, he began by extorting in 1521 the tribute refused by the king of Hungary and by overcoming the Knights of St. John at Rhodes, after a siege of six months and the loss of nearly 100,000 men. At the battle of Mohács, in August, 1526, he destroyed the Hungarian army, killing King Louis, and, marching on, captured Buda and Pesth. In 1529 he drove Ferdinand of Austria out of Buda, losing 40,000 soldiers in a vain attack on Vienna. He conquered large portions of Armenia and Persia and the whole of northern Africa except Morocco. A truce, made in 1562, finally left Hungary and Transylvania to Solyman. He died in 1565, while besieging a small fortress in Hungary.

Somaliland (*sō-mä'lē-länd*) is a peninsula on the eastern coast of Africa that extends from the Strait of Bab-el-Mandeb to the Equator. It borders the Gulf of Aden and the Indian Ocean, has an area of 197,000 square miles with a population of 800,000, and is divided into Abyssinian territory and British, French and Italian protectorates. Abyssinia and England each possess considerable portions, but Italy controls far the largest area, while France has but a small section. Game abounds, and some parts of the country produce cacti, grasses and palms, but the territory is arid and generally barren. The inhabitants are Mohammedans and of difficult disposition. They live by their herds of camels, cattle, goats and horses and by a trade in coffee, frankincense, myrrh, ostrich-feathers and salt.

British Somaliland lies along the Gulf of Aden between French Somaliland and Italian Somaliland. When Egyptian control ceased in 1884, it became a British possession. Its area is 68,000 square miles; population 300,000 Muslim nomads, except on the coast where considerable towns have arisen since 1884; and chief city Berbera with 30,000 inhabitants in the trading-season. The annual fair deals in cotton-goods, dates and rice. The exports include cattle, gum, hides, ostrich-feathers, sheep and skins. Transport is by camels, there being no porters. The protectorate is governed by a commissioner of the British colonial office.

French Somaliland, which now includes the older colony of Obok, extends from Eritrea to British Somaliland. Abyssinia lies behind it, the Gulf of Aden in front. Its area is 12,000 square miles, its population 50,000. The coast is arid, but the interior contains fertile areas. The capital is Jibutil, with 11,000 inhabitants, 500 being Europeans. France is developing the region rapidly, Jibutil having become an important shipping-station. A railway connects it with Diré Dawah, the station for Harar in Abyssinia. The country has scarcely any industries, but coastal fisheries and inland trade make considerable commerce. The chief exports are ivory, wax, coffee and living animals; the principal imports food, drink, tobacco, cottons, silks and Mocha coffee. Affairs are administered by a governor and council.

Italian Somaliland extends from British Somaliland down to British East Africa. Stretching 1,000 miles from north to south and extending 200 miles inland to Abyssinia, it covers 100,000 square miles and claims 400,000 inhabitants. Lying along the Gulf of Aden and the Indian Ocean, it occupies the extreme east or "horn" of Africa and ends in Cape Guardafui. It is but slightly known, but the bulk of the land seems arid though there are several fertile river-valleys. Arabs inhabit the coast, Somals, Gallas and other races the interior. The chief towns on the coast are Mogadishu and Obbia. The protectorate by Italy dates from 1889, and it grew in 1892, 1901 and 1905. The country is administered by the Italian government, which in 1905 gave some territory off the Aden coast to "the mad mullah," a Muslim fanatic who had for years troubled British Somaliland.

Som'erset, Lady Henry (Isabel), a daughter of the Earl of Somers, is a social and temperance reformer. Born in 1851, she married in 1873. She is the founder of a rural colony for female inebriates at Duxhurst, Surrey. She is well-known as a lecturer in the United States; has written for periodicals; is the editor of *The Women's Signal;* and has been president of the National British Women's Temperance Association. She is the author of *Studies in Black and White*, *A Book for Children* and *Our Village-Life*.

Som'erville, Mary (Fairfax), a Scotch scientist, was born at Jedburgh, Dec. 26, 1780. An algebraic sum in a magazine of fashions first interested her in the study of mathematics, in which she afterwards became famous. Her first husband, Captain Greig, was Russian consul in London, where she lived for two years until his death. The six years before her marriage with Dr. William Somerville she spent in study at Edinburgh. Going back to London in 1812, she attracted attention by experiments on the violet rays of the solar

spectrum, the results being published in the *Philosophical Transactions* of 1826. Lord Brougham asked her to put Laplace's *Celestial Mechanics* into popular form, which she did, publishing her book under the title of *Mechanism of the Heavens* in 1830. (See LAPLACE.) She was granted a pension in 1835 and made a member of the Royal Astronomical Society of England and of many foreign societies. She was in favor of "woman's rights" and woman suffrage. When 91 she spent five hours a day in mathematical studies. Other works published by her are *Connection of the Physical Sciences*, *Physical Geography* and *Molecular and Microscopic Science*. She died at Naples, Nov. 29, 1872, having lived in Italy for many years. Consult *Life* by her daughter.

Som'erville, Mass., is a suburb of Boston about two miles from the state-house. It manufactures flour, leather, iron and bricks, and has slaughter-houses, bleaching-works, iron-foundries and many fine residences. Population 70,798.

Son'net, The. We owe the sonnet, in its structure and design, to Italy. Since Shakespeare and the early English sonneteers, Sir Thomas Wyatt, the earl of Surrey and Edmund Spenser, to Wordsworth, Cowper, Byron, Keats, Shelley and the modern English and American bards, the sonnet has always had a peculiar fascination for poets of the first class. The Italian sonnet was written in its perfection by Dante, Petrarch and Tasso; and, though the form of the Petrarchan sonnet has been closely followed by English poets, the Shakespearean form has been its keen rival — both dominating other rime* arrangements of this artistic, poetic form of 14 rimed or partially rimed verse. "The Italian sonnet consisted of 14 lines, divided into two groups of eight and six lines respectively; the first eight (called the *octave*) having only two rimes between them — the first, fourth, fifth and eighth lines being in one rime, and the second, third, sixth and seventh being in the other. There then was a pause in the sense, and the six concluding lines (called the *sestette*) had two rimes between them, those rimes generally alternating in the most finished specimens. In this form of sonnet Wyatt and Surrey wrote; but since then the only fixed rule in regard to the English sonnet has been that it should consist of 14 lines. The great English masters of this form of verse have all differed in their arrangement of the rimes. Spenser divides the 14 lines thus: The first and third lines rime one way; the second, fourth, fifth and seventh another; the sixth, eighth, ninth and eleventh another; and the tenth and twelfth another, the last two lines forming a couplet with another rime. Shakespeare's sonnets consist simply of three quatrains and a couplet, the rimes being seven in number. In Milton's sonnets there is the classic division into *octave* and *sestette*, the former being properly carried out, but the latter being fitted with three rimes — the ninth and twelfth, tenth and thirteenth and eleventh and fourteenth riming together." Wordsworth admittedly is the greatest of English modern sonneteers, some of his sonnets, for exalted feeling as well as for felicity of fancy and of diction — as those dedicated to liberty and his ecclesiastical sonnets — including not only some of the finest things *he* ever wrote but some of the finest that were ever written. Here is one — in its design an apology for and commendation of the sonnet:

"Scorn not the sonnet; critic, you have frowned
Mindless of its just honors; with this key
Shakespeare unlocked his heart; the melody
Of this small lute gave ease to Petrarch's wound;
A thousand times this pipe did Tasso sound;
With it Camoens soothed an exile's grief;
The sonnet glittered a gay myrtle leaf
Amid the cypress with which Dante crowned
His visionary brow; a glowworm lamp
It cheered mild Spenser, called from Faery-land
To struggle through dark ways; and when a damp
Fell round the path of Milton, in his hand
The thing became a trumpet, whence he blew
Soul-animating strains — alas, too few!"

Sons of Lib'erty is the title taken by an organization first formed to oppose Grenville's stamp-act of 1764. It was strongest in New York and Connecticut. This association was active in promoting the separation of the American colonies from Great Britain. In Georgia the Liberty Boys drove out the royal governor; and in all the states they helped to overawe the loyalists. The Sons of Liberty incorporated about 1790 or 1800 with the Tammany Society.

Sontag (*zŏn'tăg*), **Henrietta,** Countess Rossi, a German singer, was born at Koblenz, Prussia, Jan. 3, 1806. She appeared on the stage when only six; studied music at Prague; and appeared there at 15. She rose to the first rank of European singers in her brilliant career at Vienna, Berlin and Paris. After her marriage with Count Rossi, an Italian nobleman, in 1828 she left the stage, but appeared again in 1849 on account of pecuniary troubles. She made a successful tour in the United States, and died at Vera Cruz, Mexico, June 18, 1854.

Sophocles (*sŏf'ô-klēz*), an Athenian poet, was born in 496 B. C. At 16 he was chosen to lead the chorus of youths who celebrated the naval victory of Salamis. At 28, in a dramatic contest, he was awarded the prize which had been given to Æschylus for many years. Only seven of his many dramas are preserved, but these place him at the head of the Greek dramatists. The probable order in which they appeared is *Ajax; Antigone; Electra; Œdipus the King;*

*Webster gives rime, not rhyme, as étymologically preferable and as again coming into use.

Trachinian Women; Philoctetes; and *Œdipus at Coloneus. Antigone*, one of the earliest dramas, produced in 440, gained the prize and so pleased the Athenians that he was made commander with Pericles in the Samian War. There are only fragments and titles of the other plays. He is said to have been beautiful in person, a fine musician and athlete and a ready wit. His death has been attributed to losing his breath in prolonging his voice in a public reading of *Antigone;* or to excess of joy at a dramatic victory; but without sufficient authority. He died in 405 B. C. Consult *Sophocles* in Green's "Classical Writers," by Campbell and *Lectures* by Schlegel. See ÆSCHYLUS, DRAMA and EURIPIDES.

Sorbonne (*sôr-bŏn'*), the earliest and most famous of the colleges of the University of Paris in the middle ages. It was founded in 1253 by Robert of Sorbon, and was the first institution connected with the university that was intended as a place of living as well as of study, as before this the great crowd of students of the university had found lodgings wherever they could. It was devoted to the study of theology, and the life was monastic, the students calling themselves "the poor masters of the Sorbonne." It soon became celebrated as the first theological school in Europe, its decision on disputed points was accepted as decisive, and it drew its scholars from all Europe. But when the new learning found its way into France at the beginning of the 16th century, the Sorbonne, though it had led to the introduction of printing in France, opposed all reform either in study or religion and lost its position. Its property was confiscated in the Revolution in 1792, but the Sorbonne was revived under Napoleon in 1808, and was made the seat of the three departments of the University of France,—theology, science and literature. New buildings were erected in 1884, the largest theater seating 3,000.

Soredia (*sô-rē'dĭ-ȧ*) (in plants), minute granules which appear on the surface of many lichens, making them appear powdery. Soredia are scattered by the wind and form new lichens. Each one consists of a few alga-cells invested by some fungus filaments. See LICHENS.

Sorel (*sô-rĕl'*), **Can.,** county-seat of Richelieu County, Quebec, lies on the St. Lawrence at the mouth of Richelieu River, taking its name from a captain of the Carignan-Salières regiment, who built a fort on this site in 1665. It has 7,057 inhabitants, engaged in trade with the surrounding country and in its shipyards and foundries.

Sorghum (*sôr'gŭm*), a plant belonging to the grass family, whose original home is thought to have been the interior of Africa, but it has not yet been found growing wild there. It is nearly related to the sugar-cane, and has been cultivated from the most ancient times. It is extensively cultivated in this country for the production of sorghum-molasses, and a large amount of sugar is also manufactured as an incidental product. As a source of sugar, however, it does not compete with sugar-cane and the sugar-beet. See SUGAR.

Sorus (*sō'rŭs*) (in plants), a definite group of sporangia, as in the ferns, in connection with which the term is chiefly used. See FILICALES.

Sothern (*sŭth'ĕrn*), **Edward Askew,** an American actor, was born at Liverpool, England, April 1, 1826. His first appearances on the stage in England and the United States were not particularly successful, until in 1858 he assumed the character of Lord Dundreary in the comedy of *Our American Cousins*, which was made so rich and entertaining by Sothern's acting that it became famous, the comedy running 140 nights in New York and nearly 500 in London, and being again and again repeated at other times. His most successful character next to Dundreary was David Garrick, both characters making his name famous. He died at London, Jan. 21, 1881. Consult Pemberton's *Memoir.*

Soulanges (*sōō'länzh'*) **Canal, Can.,** extends from Cascade Point to Coteau Landing, overcoming the Cascade Rapids, Cedar Rapids and Coteau Rapids. From the head of the Lachine to the foot of the Soulanges the distance is 16 miles. Its length is 14 miles. It has five locks, 280 by 45 feet. The total rise or lockage is 84 feet. It is 100 feet wide at the bottom and 164 at water-surface. The depth of water on the sills is 15 feet. See LACHINE.

Soult (*sōōlt*), **Nicholas Jean de Dieu,** marshal of France, was born at St. Amans-la-Bastide, March 29, 1769. He enlisted as a private and was six years in reaching the rank of sergeant, but then rose rapidly. He was from 1794 to 1799 in constant service in Germany and on the French frontier. He served in command of a division under Masséna in his Swiss and Italian campaigns. In 1802 Napoleon made him one of four consular guards, and in 1804 a marshal. He decided the battle of Austerlitz by piercing the Russian center, and was in the Prussian and the Russian campaign. He drove the British out of Spain and held Portugal until driven out in turn by Wellington. As commander in Spain he gained a victory at Ocaña in 1809, and subdued Andalusia. Failing to enlist Joseph Bonaparte in his plans, he asked to be relieved of his command, but was sent back by Napoleon, after the battle of Vittoria, as the only commander who could turn back the tide of disaster and successfully meet the strategy of Wellington with his own brilliant tactics. He became a royalist, when Napoleon had abdicated, but went back to him on his return from Elba. He was banished after

Waterloo, but in a few years was restored to his former honors. In 1838, at the crowning of Queen Victoria, he was sent as an ambassador to England and warmly welcomed by Wellington, his old opponent. His last honor was the title of Marshal General of France. He died on Nov. 26, 1851. Consult Napier's *History of the Peninsular War*.

Sound. See ACOUSTICS.

Sound, The, a strait which forms the passage from the North Sea to the Baltic. It is 50 miles long, and lies between Sweden and the Island of Zealand. From the 15th century until 1857 all vessels passing through The Sound, with a few exceptions, paid toll. By the treaty of March 14, 1857, these Sound duties were abolished, about $16,000,000 being paid to Denmark, which agreed to keep up the lighthouses on the coast. Nelson forced the passage in spite of its strong defenses in 1801.

Sound'ing is measuring the depth of the sea. It has been done from the earliest times by a rope, marked off into fathoms, with a leaden weight attached. The difficulty was that there was no certainty that the weight had reached the bottom. In 1854 a new method was tried by which the weight or sinker would be removed from the line when it struck the bottom. Wire-rope is usually used for deep-sea soundings. Magellan tried to find the depth of the Pacific in his first voyage around the world, and, when he could not find the bottom at 200 fathoms, concluded that he had crossed the deepest part of the ocean. In 1818 Sir John Ross found the depth of the Arctic seas to be 1,050 fathoms; in the Antarctic Ocean he reached 2,425 fathoms, and twice, with 4,000 fathoms of line, no bottom was reached. Consult Sigsbee's *Deep-Sea Sounding and Dredging*.

Sousa (*sōō'zȧ*), **John Philip,** American orchestra-conductor and band-leader, was born at Washington, D. C., in 1854, and early manifested musical talent and proclivities toward the orchestra in theaters as well as familiarity with the life of a circus musician. Even at 17 he was a band conductor and one of the first violin players in an opera troupe. From 1880 to 1892 he was band-leader of the United States Marine Corps, and since director of his own well-known band. He has composed many orchestral pieces, marches, songs, waltzes etc., with light operas, as *El Capitan*, *The Bride Elect* (libretto and music) and *The Charletan*. Among his other compositions, many of which have become very popular, are *Sheridan's Ride*, *The Liberty-Bell*, *The High-School Cadets* etc.

JOHN PHILIP SOUSA

South Af'rican Republic. See TRANSVAAL.

South Amer'ica. See AMERICA.

South Austra'lia. See AUSTRALIA.

Southampton (*sŭth-hămp'tŭn*), an important seaport in England, 79 miles southwest of London. There are remains of the town-walls, built in the 14th century, and four of the seven gates. The oldest church, St. Michael's, shows the Norman architecture, and God's House, dating from the 12th century, is one of the earliest hospitals in England. There are large docks, a new one covering 18 acres being built in 1890. There is a large cattle-trade with Spain and Portugal, and shipbuilding is extensively carried on. Southampton, called in the Saxon *Chronicle* Suth Hamtune, was founded by the Anglo-Saxons. It was burned by the French, Spanish, and Genoese fleets in 1338. The White Star steamships to the United States sail from Southampton. Population 119,745. Consult Davies' *History of Southampton*.

South Bend, Ind., county-seat of Saint Joseph County, on the St. Joseph River, 86 miles southeast of Chicago The Roman Catholic University of Notre Dame (*q. v.*), the largest Catholic school in the west, is a short distance north; there are fine buildings, a library and a Gothic church with the famous Chimes of Notre Dame, 13 full collegiate courses of study and 1,000 students. There are ten wagon and carriage works, the most extensive being the great Studebaker wagon and carriage works covering nearly 100 acres. The Oliver plow-works occupy 43 acres, and there are manufactories of agricultural implements, besides automobiles, steel-ranges, sheet-iron products, watches, knit-underwear, furniture, paper, woolens and flour. All told, the city contains over 300 factories. South Bend has 32 churches, admirable public and parochial schools, commercial schools, a teacher's training-school, a conservatory of music and a public library. Population 44,605.

South Beth'lehem, Pa., on Lehigh River, opposite Bethlehem, is the principal Moravian town in America, founded in 1745. South Bethlehem has factories of steel, zinc, boilers and shovels. It is the site of Lehigh University, founded in 1865 by Judge Packer, who gave 115 acres of land and $2,500,000. The fine buildings stand on a terrace on South Mountain, and include a fine gymnasium, observatory, several fine laboratories and a beautiful Gothic library-building. Population 15,005.

South'bridge, Mass., a town in Worcester County on Quinnebaug River, 21 miles from Worcester. The settlement was made

about 1730, and incorporated in 1816. Its chief manufacturing establishments are woolen and cotton mills, shuttle-works, optical instruments, printing and knife works. The town has good public and parochial schools, a high school, a fine library, several churches and a Y. M. C. A. building. Southbridge is on a branch of the New York, New Haven and Hartford railroad. Population 11,195.

South Car'oli'na, one of the original states of the American Union, popularly known as the Palmetto State, lies between North Carolina on the north, North Carolina and the Atlantic on the east, the Atlantic and Georgia on the south and Georgia on the west. It is shaped like a triangle. Its area is 33,393 square miles, and there are 41 counties. Population 1,340,316. Capital: Columbia (24,564). Chief cities: Charleston (56,317); Greenville (13,810); and Spartanburg (14,905).

Surface. The state consists of two distinct belts, the coastal plain and the Piedmont plateau, and is naturally divided into sections known locally as low country and up-country. These sections are separated by high sand-hills parallel to the coast and the mountains, forming the head of navigation on all the principal rivers. The coastal plain itself is what is called a belted coastal plain, being divided according to form, soil and vegetation into four belts parallel to the shore line: The coastal belt; the lower pine-belt; the upper pine-belt; and the hill-belt. Above the sand-hills are the Piedmont region, which stretches to the foot of the mountains, and the Alpine region, which begins at the foot-hills of the Appalachian Mountains and occupies the northwest corner. The Alpine region ranges from 900 to 3,000 feet in altitude. Mount Pinnacle in Pickens County, the highest point in the state, is 3,436 feet above sea level.

Rivers. The main river-systems are the Pedee, the Santee and the Savannah. These rise in the Appalachian region of North Carolina, and are navigable to the falls' line. Between the Santee and the Savannah system are the minor river-systems, which include Ashley, Cooper, Edisto and Combahee Rivers. The Ashley and Cooper, which are arms of the sea rather than rivers, unite in forming Charleston harbor.

Climate. The climate is equable and healthful, except in swampy portions near the coast. The summer's heat is tempered by the influence of the mountains in the northwest and by the sea-breezes in the southeast. The mean annual temperature is 63° F. The annual rainfall is 48.70 inches. The mountains in the higher part of the state are pleasant summer-resorts, while the dry, bracing atmosphere and the long-leaf pine-forests of the sand-hills make that section an ideal winter-home for invalids and pleasure-seekers.

Resources. The field and forest products are more varied, perhaps, than those of any other state. There is a variety of climate from the coast, where the sea is tempered by the Gulf-Stream, to the mountains, where it is too cold for cotton to mature. The products range from oranges, lemons and grape-fruit to rye, barley and wheat; the forest-trees from the palmettoes, cypress and magnolias to the ash, white pines and hemlocks. South Carolina leads the world in the yield of corn per acre, as demonstrated in world-contests; in the yield of upland cotton per acre; in the yield of rice per acre; in the quality of sea-island cotton; and in the quality of rice. South Carolina has the only successful tea-gardens in America. In cotton-manufacturing it is second only to Massachusetts. In production of gold it leads all states east of the Rockies. In volume of cotton-crop it ranks fifth. The following shows the value and development of this agricultural industry:

	1900	1905	INCREASE PER CENT.
Value (including seed)	$24,427,171	$63,863,633	169.3
Bales consumed in mills	501,290	620,839	23.8
Value sea-island crop	$771,751	$1 155 829	134.0
Value cotton-seed		$8,878,644	

Manufactures. In all lines of manufacturing advance has been made as shown by the following summary:

	CAPITAL	
INDUSTRIES	1900	1905
Cotton goods	$39,258,946	$ 82,337,429
Lumber and timber	3,469,984	7,237,725
Cottonseed-mills	1,959,872	5,177 178
Fertilizers	10,508,043	7,086,878
Planing-mills etc	412,128	947,186
Railroad-car shops	345,842	299,923
Hosiery etc., etc	354,212	823,822
Total	$56,306,027	$103,910,141

	PRODUCTS	
INDUSTRIES	1900	1905
Cotton-goods	$29,723,919	$49,437,644
Lumber and timber	4,942,362	6,791,451
Cottonseed-mills	3,103,425	5,462,818
Fertilizers	4,882,506	3,637,576
Planing-mills etc	1,016,328	1,478,581
Railroad car shops	691,361	1,080,900
Hosiery etc., etc	392,237	1,078,682
Total	$44,752,138	$68,967,742

Minerals. There are two valuable gold-mines in operation, and several undeveloped gold mines. Rich deposits of kaolin and fine brick-clay extend entirely across the state. Granite quarries are numerous. A valuable tin-mine has recently been opened, and is proving a noteworthy success. There are deposits of iron, fuller's earth, manganese, monazite, asbestos, mica, nickel and many other minerals of commercial value, but the most valuable mineral resources are the beds of phosphate rock near Charleston and Beaufort. These

deposits underlie the surface from six inches down to 12 feet. All the rocks in these sections are phosphates.

Value of mineral products of South Carolina during 1906 was

Gold	$ 108,000
Phosphate rock	1,225,000
Tin (recently opened)	16,000
Stone	300,000
Lime	40,000
Clay	950,000
Marl	10,000
Monazite	43,000
Mica (recently opened)	1,000
Mineral waters	80,000
Total	$2,773,000

Education. The state provides free schools for all children between six and 21. The schools for the white and the colored race are separate. The state supports four institutions for the higher education of the white people: South Carolina University at Columbia, South Carolina Military Academy at Charleston, Clemson Agricultural and Mechanical College at Clemson; and Winthrop Normal and Industrial College (for girls) at Rock Hill; and one for Negroes, the Normal and Industrial and Mechanical College (for both sexes) at Orangeburg. The institution for the deaf, dumb and blind supported by the state is at Cedar Springs.

Summary of Annual Educational Expenditures:	
5 State Colleges (white)	$ 350,000
1 State College (Negro)	25,000
20 Private and denominational Colleges (white)	300,000
6 Private and denominational Colleges (Negro)	100,000
245 City and town schools (white)	300,000
178 City and town schools (Negro)	70,000
2,674 County schools (white)	1,152,093
2,350 County schools (Negro)	252,380
Enrollment in public schools (white) 147,053	
Enrollment in public schools (Negro) 171,022	
Value of county school-property	$2,000,000

History. South Carolina was claimed by France, England and Spain either by right of conquest, purchase or discovery; but the first settlement on the soil was made by French Huguenots in 1562 near Beaufort. This colony was a failure. The first permanent settlement was made by the English in 1670 on Ashley River near Charleston. Two hundred Negro slaves were brought from Barbadoes in 1671, and since 1820 the Negro population has exceeded the white. In 1685 a large number of French Huguenots settled in South Carolina, and later German, Irish, Scotch and Welsh immigrants arrived. In 1729 George II divided the region into North and South Carolina. At first the government was in the hands of noblemen who appointed the governor under a constitution prepared by John Locke of England. Locke's constitution was poorly suited to the needs of the colony, and there was constant friction between the people and the governors. In 1719 proprietary government was abolished, and the colony was ruled by a governor and council appointed by the king and an assembly elected by the people. Prosperity began, and lasted until the beginning of the Revolution. In early years the colony suffered from Indian raids, but finally all the Indians except the Catawbas were driven out. These Indians still have a small reservation on Catawba River. Less than a hundred survive. In 1774 the first act was passed to oppose royal usurpation by force, and in the following year the first military force was raised for defense of the colony against the English government, and the importation of British goods was prohibited. The first important victory of the Revolutionary War was won at Fort Moultrie, June 28, 1776. Later, Charleston was captured and made the British headquarters in the south, Ninety-Six and Camden were taken, and, but for the resistance of Marion and Sumter, the state would have been conquered. The tide turned at King's Mountain, severe battles were fought at Cowpens and Eutaw Springs and the British were driven back until they held only Charleston. When the government under the Federal constitution had been established, South Carolina, under the direction of John C. Calhoun, soon became the leading exponent of state-sovereignty. The nullification act was passed in 1833, by which South Carolina declared the United States tariff null and not binding upon her citizens. The act was approved by the governor, but President Jackson pronounced it treason. The state-sovereignty contention almost precipitated war in 1833, and finally led to the Civil War in 1861–5. The state suffered heavily during the war, and worse during the reconstruction days which followed — a period of misrule and demoralization. The slaves already in the majority were made citizens. The better class of white people were not allowed to participate in the government. This state of affairs continued until 1876, when Gen. Wade Hampton was elected governor. Then the present era of prosperity began. In 1895 a new constitution was adopted, which required an educational or property qualification for citizenship. The right of suffrage belongs only to men 21 years old who can read and write and to men who, though they cannot read and write, own $300 worth of property. This law disfranchises a great number of ignorant and thriftless people. As there are more colored than white men disqualified, white voters are in the majority.

South Carolina, University of, was chartered in 1801 and opened in 1805. It closed in 1863 and in 1877. In 1865 departments of medicine and law were added. In 1878 the university divided into South

Carolina College and Claflin College, the first for white, the second for colored students. In 1882 new departments were added to South Carolina College, it ceasing to be merely a college of agriculture and mechanical arts, and in 1884 a law-school was added. In 1887 a college of pharmacy, a graduate department and a normal school were added. In 1890 the agricultural, mechanical, medical and normal courses were dropped, but in 1894 the last were restored. The university offers courses (1) in classics, Latin and science, Latin and literature or modern literature; (2) in mathematics, chemistry or chemistry and biology; (3) in normal studies; (4) in law; and (5) in graduate studies. The state gives 41 scholarships, one to each county, for normal students, and there are 12 other scholarships. The faculty numbers 25, the students 385 and the library 38,000 volumes. The college has no productive funds. Its income in 1907 was $61,756.

South Dako'ta, a north-central state of the Union, familiarly styled the Coyote State. Its entire area is 77,650 square miles; length, 245 miles; extreme breadth 380 miles. Forming a rectangle, the state is bounded on the north by North Dakota, on the south by Nebraska, on the west by Montana and Wyoming and on the east by Minnesota and Iowa. It is traversed about its center from north to southeast by the Missouri, the chief settled and more fertile portion lying to the east of this river; while west of it are the Indian reservations and the mining region known as the Bad Lands together with the Black Hills. The population in 1900 numbered 401,570; in 1908 it was estimated at 485,000. Capital: Pierre (2,560). The other chief towns are Sioux Falls (12,681), Lead City (7,210), Yankton (4,675), Mitchell (4,300), Watertown (over 5,000); Aberdeen (5,310); and Huron (3,796).

Surface and Climate. The state has a dry, bracing climate, with a mean annual temperature of 44.3° F., the warm chinook winds tempering the extreme cold and blizzards of winter. It has a light snowfall in winter and an average annual rainfall, especially in the settled and fertile eastern section, where farming is chiefly carried on. In the west much of the state is not only treeless, save in the region of the Black Hills, but is infertile, being for the most part covered with igneous rocks and coarse gravel.

Natural Resources. The state in its agricultural statistics does not attain the rank of North Dakota in production of the chief cereals. It does far better, however, than its northern neighbors in raising Indian corn. In 1906 its corn-yield amounted to 62,812,500 bushels, while wheat yielded 41,955,400 and oats 46,410,000 bushels. Potatoes, barley and flaxseed are important crops, as is also the yield of hay. Stock-raising is an important industry, the number of farm animals in 1906 being dairy-cows 582,469; neat cattle 1,323,507; horses, 476,603; swine, 845,192; and sheep, 822,838. The wool-clip of 1906 was 3,737,500 pounds. In minerals the state makes a fair showing; the yield from gold in 1905 was $6,913,900 in amount; silver yielded $109,190; while there were fair returns from lead, copper and tin. The other products include sandstone, limestone, clay, cement, mica, natural gas and granite.

Manufactures. South Dakota is fast developing into a manufacturing state, having in 1900 over 1600 industrial establishments, with an aggregate capital of $7,585,142, the wage-earners numbering 3,121 and the total value of products being $13,085,333, half of which was yielded by the flour and grist mills, in addition to the output of factory-made butter. The value of the latter in 1900 was nearly $2,200,000, and the value of the printing and publishing industries exceeded $1,220,000. Sioux Falls is one of the chief industrial centers.

Commerce and Transportation. In 1907 the mileage of the state's railroads exceeded 3,175 miles, the chief lines on the east side of the Missouri being the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern and the Great Northern. The Black Hills region, in the southwest, with its principal mining-towns of Lead City, Deadwood and Rapid City, is reached from railroads extending northward from Nebraska. The Missouri also is a chief artery of transporation. Banking facilities are good, there being 79 national banks in 1906, with an aggregate capital of about three million dollars and individual deposits exceeding 17 millions. There were, besides, 225 state banks, with a combined capital of over $2,660,000, and over 14½ millions of deposits. The assessed valuation of property in 1906 was about 225 millions, while the state's receipts for the year exceeded $2,300,000 and the expenditure was in the neighborhood of two millions. The debt in 1906 was close upon $650,000.

Education. In 1904 the total expenditure for public schools exceeded two and a quarter millions, nearly one and a half millions being expended for teachers' salaries. Of the 137,000 of school-population in 1904 about 107,000 were enrolled, though the average daily attendance was but 74,000. Besides state normal schools located at Madison, Springfield, Aberdeen and Spearfish, there are an agricultural college at Brookings and a school of mines at Rapid City. In the larger towns there are high schools. Higher education is represented by the following universities and denominational colleges: the University of South Dakota at Vermilion; Dakota Wesleyan Uni-

versity (Meth. Epis.) at Mitchell with 24 instructors and 604 students; Yankton College (Cong.) with 25 instructors and 358 students; Huron College (Presb.); Redfield College (Cong.); Sioux Falls College (Baptist); and Mennonite College at Freeman. Besides these institutions there are reformatory and penitentiary schools maintained by the state, schools for the blind and for deaf-mutes and asylums and hospitals for the insane.

History. (For the early annals and for the history of the Dakotas see NORTH DAKOTA). In 1828-30 a fort was erected at Pierre, which was subsequently sold to the Federal government. Late in the fifties settlement began at Sioux Falls and in the territory to the eastward, while Yankton became the territorial capital in 1863, which was removed 20 years later to Bismarck and, in 1889, to Pierre. An impetus was given to settlement by the construction of railroads, begun about 1872, and by the Custer discovery of gold in 1874 in the Deadwood district and the region of the Black Hills. The movement for statehood dates about from 1883, though it was not until 1889 that the state, and with it North Dakota, was admitted into the Union with a constitution of its own. Indian reservations were further opened to settlement in the nineties. Consult Child's *South Dakota;* Hagerty's *The State of South Dakota;* Beadle's *Dakota;* and Todd's *Hydrographic History of the State.*

South Dakota, University of, a co-educational institution, organized in 1882 at Vermilion, S. D , and mainly supported by the Legislature for the work it does in the geological survey of the state, though it is otherwise well-endowed by land-grants and other resources. Its courses of study embrace pedagogy, music, commerce and engineering as well as arts and sciences. It has a faculty of 50, a student attendance of 450 and a library of about 16,000 volumes. Its tuition fees are but nominal; while it has a loan-fund for the assistance of needy students. Its income in 1907 was $84,347.

South'ern Niger'ia. See LAGOS and NIGERIA.

South McAl'ester, Okla., a city, capital of the Choctaws, annexed in 1906; it is on the Choctaw, Oklahoma and Gulf and Missouri, Kansas and Texas railways, about 50 miles south-southeast of Okmulgee, Creek Nation, and about 84 miles southeast of Fort Smith, Ark. It lies in a rich coal-mining district, and (besides several foundries, machine-shops and brick-plants) it has cotton-compress establishments, flour-mills, bottling-works, a tannery and macaroni, cigar and mattress factories. Though settled so recently as 1885, the town was incorporated in 1899 and has since grown considerably. Its population (1908) is estimated at about 10,000.

South Mount'ain, Battle of, an engagement of the Civil War precipitated by Lee's first invasion of Maryland in Sept., 1862. The battle occurred on Sept. 14th on South Mountain, a continuation of the Blue Ridge north of the Potomac, and near Boonsboro, Washington Co., Md., when the Federal army under McClellan fell upon the Confederates under Lee at Turner's and Crampton's Gaps in the mountain-range. There was stubborn fighting all day, as the Union forces pressed the rebels back and finally compelled them to withdraw, leaving their dead upon the field. At Turner's Gap there was a loss of about 1,500 on each side, while 1,500 Confederates were taken prisoners. At Crampton's Gap the losses were close upon 500 on each side, besides 400 Confederates taken prisoners. The engagement is known in the north as the Battle of South Mountain, while in the south it was called the Battle of Boonsboro.

South O'maha', Neb., a flourishing town, adjacent to Omaha City, in Douglas County, the seat of one of the largest meat-packing establishments in the United States. It is on the Chicago, St. Paul, Minneapolis and Omaha; Burlington; Fremont, Elkhorn and Missouri Valley; and Union Pacific railroads. It has a number of fine public buildings, including schools, churches, banks; its population grew in a decade from 8,062 to 26,001, and at present is 36,765.

South-Sea Scheme, called the South Sea Bubble, was a plan orginated by Harley, Earl of Oxford, to provide for the extinction of the public debt. A company was formed to which was given the monopoly of the trade of the South Seas and of certain import duties. It agreed to pay the government six per cent. yearly on its debt of $50,000,000. The stock rose until it was quoted at 1,000, when some of the principal directors sold out. The bursting of the bubble followed, many large stockholders fled, and the excitement was so great that Parliament was summoned to decide on the best means of helping in the public distress. Though nothing fraudulent was proved against the directors, their property was confiscated for the benefit of the sufferers, and $35,000,000 due the government was remitted, but this only availed to mitigate very slightly the ruin wrought.

South'ern Cross, a group of stars in the southern hemisphere of the heavens, at a considerable distance from the south pole. The four principal stars form a rough cross. It was added to the list of constellations in 1679.

Southey (*south'ĭ*), **Robert,** an English poet, was born at Bristol, England, Aug. 12, 1774. He studied at Oxford. Coleridge and Southey married sisters, and after various experiments, reading law, a secretaryship in Ireland, two visits to Lisbon, with intervals in London, Southey settled at Greta

Hall in the English Lake-Country where Coleridge lived, and devoted himself to writing, for a long time supporting Coleridge's family as well as his own. His works number nearly 50, filling more than 100 volumes, and many contributions to periodicals besides. *Madoc*, *Curse of Kehama*, *Thalaba* and *Roderick* are among his longer poems, though he is best known by a few short ones, as the *Battle of Blenheim* and *How the Water Comes Down at Lodore*, and by his *Life of Nelson*, one of the best biographies in English literature. He wrote also in prose a *History of Brazil* and *History of the Peninsular War*. His works brought him a competency and were rewarded by a pension, an honorary degree and the offer of a baronetcy, and in 1813 he was made poet-laureate. He died on March 21, 1843. See *Southey*, in the English Men of Letters Series, by Dowden.

Spadix (*spā'dĭks*), a peculiar spike-like form of inflorescence of the *Aroids* (*q. v.*), in which the axis is fleshy. The minute sessile flowers occur only on the lower part of the axis as in Jack-in-the-Pulpit, or completely cover it. See INFLORESCENCE.

Spain, one of the European states, forms with Portugal the southwestern peninsula.

Area and Surface. It is separated from France by the Pyrenees Mountains, and at its most southern point from Africa by the Strait of Gibraltar, and washed on three sides by the waters of the Atlantic and the Mediterranean. The Balearic Islands, on its Mediterranean coast, belong to Spain. The coast, 1,317 miles long, is broken by fine harbors, as Vigo, Corunna, Cadiz, Malaga and Barcelona. Its area is 194,783 square miles, its population 18,618,086. Madrid is the capital (population 539,835). Other chief cities are Barcelona (533,000), Valencia (213,530), Sevilla (148,315), Malaga (130,109), Marcia (111,539) and Cartagena (99,871). The Mediterranean shore in the south is rocky, sloping upward to the Sierra Nevada Mountains. The country is a high plain, crossed by several ranges of mountains, the highest points being in the Pyrenees and the Sierra Nevada. The rivers, of which there are 230, flow mostly into the Atlantic; the Tagus, Guadalquivir, Douro and Ebro being some of the largest.

Resources. The mines of Spain have been worked from the earliest times. There are mines of lead, copper, tin, iron, salt and coal. Gold and silver were formerly produced in Galicia, but now silver is found only in Seville, while the quicksilver mines of Almaden are the richest in Europe. The largest industry is farming, which employs from 60 to 70 per cent. of the people. Besides the cereal crops, saffron and dye-plants, mulberry trees for the rearing of silkworms and large quantities of southern fruits are cultivated. Wine is one of the principal exports. Large herds of cattle, sheep, hogs, asses and mules are raised, and the horses are descended from the Arabian breeds.

Manufactures. The manufactures do not equal those of the middle ages, when Spain was noted for wool and silk goods and arms. The principal manufactured products are cork and cotton, besides silk, linen, leather, glassware and arms. There are a comprehensive postal system, 9,190 miles of railway, 20,540 miles of telegraph and 4,970 miles of telephone.

Education. Spain has universities — at Madrid, Barcelona, Granada, Valladolid, Saragossa, Seville, Santiago, Salamanca, Oviedo and Valencia — with 391 professors and about 16,000 students. The school-system varies with different provinces, the larger cities and a few of the provinces having schools equal to the best in Europe, but in many others the schools are poor. The public and primary schools are supported mainly by the municipalities, and most of the children are educated free. However, a large proportion of the inhabitants are illiterate. There is on an average one school for every 560 persons.

Government. Spain is governed by a hereditary monarchy, its present constitution being settled in 1870. The Cortes, as the legislative body is called, consists of two parts — the senate and the chamber of deputies. One third of the senate hold their seats by inheritance, one third are appointed by the king, and one third are elected. In 1890 universal suffrage was introduced. The army in time of peace numbers about 100,000, and the navy 15,725 men, besides 9,000 marines. There are 13 military schools and colleges.

History. The Phœnicians and Greeks were the earliest visitors to Spain, where they found a race called by the Greeks Iberians, consisting probably of a number of different tribes. The Carthaginians made the first effort to occupy Spain, founding Carthagena, and were expelled by the Romans in 206 B. C. The Roman conquest was completed in 19 B. C., when Augustus divided *Hispania*, as they called it, into three provinces. The country became a thorough Roman province, adopting the Latin language and the Christian religion. After the invasion of the Goths, Spain became a province of the Visigoths until 573, when she became the seat of the Gothic kingdom, which was destroyed in 711 by the Arab and Moorish invaders. The Moorish kingdom in Spain, lasting three centuries, reached its highest prosperity in 756. Cordova, their capital, was the finest of western Europe, as may be seen in its grand mosque. Their last stronghold in Spain was Granada, which surrendered to the Spanish army on Jan. 2, 1492. The different provinces of Christian Spain have at times been independent and then conquered and

united. Alfonso I conquered Galicia, with a part of Leon and Castile, and called himself the king of the Asturias; and Alfonso III, taking possession of the whole of Leon, called it the kingdom of Leon. Navarre was an independent state in the 9th century, and became a powerful kingdom. Castile, at first a republic, was afterwards subject to Leon, then again independent until Ferdinand the Great united it with Leon. Aragon, first a part of Navarre, became an independent kingdom, and then was united with Catalonia. In 1037 the union of Leon, Castile and Galicia made Ferdinand the Great the most powerful ruler in Spain. The marriage of Isabella of Castile with Ferdinand of Aragon united those kingdoms, and the conquest of Granada completed the consolidation; which, with the conquest of Naples, the discovery of America by Columbus and the possession of large parts of the new continent, raised Spain to a high place among European nations. Philip II exhausted the strength of the country in his wars with the Netherlands, in his great preparations for the Invincible Armada and in building the Escorial. The great kingdom he had inherited from his father, Charles V, began to show decline. Spain sided with the emperor in the Thirty Years's War, but received nothing in return, and soon became a subject of contest between the different European powers. Philip V was the first of the Bourbon kings of Spain, whose accession led to the war of the Spanish Succession, ending in the peace of Utrecht in 1712. From 1808 till 1813 Joseph Bonaparte was king of Spain, though the people did not acknowledge him. Ferdinand VII was restored to power in 1814, and by the help of the French triumphed over the Liberal party in the kingdom. Florida was sold to the United States, and a large part of the South American colonies were lost during this reign. During the regency of Christina and the reign of Isabella the Liberal party gained ground until Isabella fled to France in 1878, resigning in favor of her son Alphonso XII. There were a provisional government for two years, then a short reign by Amadeus of Savoy and finally a republic, ending with the second Carlist war from 1872 to 1876. Don Carlos, who claimed the throne as a brother of Ferdinand, withdrew to France, and Alphonso XII reigned 11 years. The present king, Alphonso XIII, was born in 1886, but the country was governed by his mother as queen-regent until 1904. During 1868-78 Cuba struggled unsuccessfully for independence, Campos of Spain distinguishing himself then and again in 1895. The second revolt of Cuba (that of 1895) led to the Spanish-American war of 1898, that resulted in the complete destruction of the Spanish fleet and the loss of all colonies, save those in Africa. See SPANISH-AMERICAN WAR. Consult *Philip II* by Prescott; *The Moors in Spain* by Poole; *Wanderings in Spain* by Hare; and *Castilian Days* by John Hay.

Spalding, John Lancaster, Roman Catholic bishop of Peoria, Ill., was born at Lebanon, Ky., on June 2, 1840. After passing through the public schools of his own town, he attended St. Mary's College at Emmetsburg, Md. He received the degree of doctor of divinity at Louvain, Belgium, in 1863. After ordination he took a special course at Rome, Italy, and when 25 returned to the United States. For a time he was secretary and chancellor of the diocese of Louisville, at which time he took part, as a theologian, in the second plenary council of Baltimore. His first literary task was writing the life of his uncle (Archbishop Spalding of Baltimore). In 1872 he moved to New York City, where he was assistant-rector of St. Michael's Church, a post which he held until he was made the first bishop of Peoria on May 1, 1877. He has several times refused further elevation in the church. As a writer John Lancaster Spalding is even better known than as a prelate, and as a lecturer he holds a distinguished place in this country. His literary style has been compared to that of Emerson. Among his published works are *Socialism and Labor; Thoughts and Theories of Life and Education; Education and the Higher Life;* and *Things of the Mind.* Aside from his interest in secular educational institutions, he has given much time and thought to higher education within the church, and is practically the founder of the Catholic University at Washington. He was one of the arbitrators named by President Roosevelt to settle the anthracite strike in 1902. Because of ill-health his resignation was tendered to the papal see on Sept. 10, 1908.

Spandau (*spän'dou*), a Prussian town and strong fortress, is on the Spree, eight miles northwest of Berlin. As it defends the capital on that side, it is very strongly fortified, and in its citadel is kept the reserve fund of $30,000,000, reserved by the government ready for war. There are an arsenal, a cannon-foundry, gunpowder-factories and a garrison of 4,000 men. One of the oldest towns in Brandenburg, it surrendered to the Swedes in 1634, to the French in 1806 and to the Prussians in 1813. Population 70,301.

Span'ish Africa consists of Adrar and Rio de Oro on the Atlantic coast of the Sahara between Capes Blanco and Juby; Cape San Juan and Rio Muni between French Congo and Kamerun; Annobon, Corisco, Elobey and Fernando Po Islands in the Gulf of Guinea; and Ceuta and Melilla on the Mediterranean coast of Morocco, with Alhucemas, Chaferinas and Peñon de la Gomera. (The Canary Islands, though geographically belonging to Africa,

are a part of Spain for administrative purposes). The area of these possessions, which are the last fragments of Spain's once world-wide colonial empire, is 80,580 square miles, though some authorities who give an enormous extension to Spanish Sahara give the area as 243,890 square miles; and the population is 291,946. Rio de Oro and Adrar cover 70,000 square miles and have 130,000 inhabitants, governed from the Canary Isles. Rio Muni extends over 9,800 square miles, and possesses a population of 140,000, including 300 Europeans. The coast is low and marshy, luxuriant in vegetation and covered by huge forests. There are commercial agencies and mission-stations of Roman Catholics and American Presbyterians, but harbors are wanting and the rivers are inaccessible to ships. The islands in the Gulf cover 780 square miles and have 21,946 inhabitants. The North African possessions are used chiefly as convict-stations. Ceuta's population, included in that of Cadiz, Spain, is 13,000, Melilla's 9,000. The Spanish army in Africa is recruited wholly from Spain, and comprises 6,200 men. Spain has given France the right of preëmption in case it should sell any of the Spanish colonies or adjacent islands.

Spanish-American War. The people of the United States had long watched the struggle of the Cubans (see CUBA) against the tyranny of Spain (*q. v.*), and with deep sympathy and indignation had witnessed the inhuman cruelties with which the war had been waged on the part of Spain. The devotion of the Cubans to their cause, the brutality with which the peaceable inhabitants of the island were treated and the inability of our government to induce Spain to adopt reforms that would be acceptable to the Cubans made intervention a duty the United States could not evade. The tension of the situation was increased by the destruction of the United States battleship *Maine* by an explosion while on a friendly visit in the harbor of Havana (*q. v.*), on the 15th of February, 1898. Of her crew, 266 men, including two officers, were killed. A naval court of inquiry after thorough investigation declared it to be their opinion that the *Maine* was destroyed by a submarine mine. The American people, while not asserting that the act was one of treachery on the part of the Spanish government, did believe that without complicity on the part of Spanish officials at Morro Castle the vessel would not have been blown up by mines operated by electric batteries located within that fortification.

Matters now drifted rapidly toward war. On April 11, 1898, President McKinley sent a message to Congress in which he declared that he had exhausted every effort to prevent a resort to arms. On April 19 Congress passed the following preamble and resolutions:

WHEREAS, The abhorrent conditions which have existed for more than three years in the island of Cuba, so near our own borders, have shocked the moral sense of the people of the United States, have been a disgrace to Christian civilization, culminating as they have in the destruction of a United States battleship, with 266 of its officers and crew, while on a friendly visit in the harbor of Havana, and cannot longer be endured, as has been set forth by the President of the United States in his message to Congress of April 11, 1898, upon which the action of Congress was invited; therefore,

Resolved, 1. That the people of the island of Cuba are and of right ought to be free and independent.

Resolved, 2. That it is the duty of the United States to demand, and the government of the United States does hereby demand, that the government of Spain at once relinquish its authority and government in the island of Cuba and withdraw its land and naval forces from Cuba and Cuban waters.

Resolved, 3. That the President of the United States be, and he hereby is, directed and empowered to use the entire land and naval forces of the United States and to call into actual service of the United States the militia of the several states, to such extent as may be necessary to carry these resolutions into effect.

Resolved, 4. That the United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction or control over said island, except for the pacification thereof, and asserts its determination, when that is accomplished, to leave the government and control of the island to its people.

On April 21 the American minister at Madrid received passports from the Spanish government, and on the same day the Spanish minister left Washington. On April 24 Spain issued a declaration of war with the United States, and next day the American Congress issued a similar declaration. The president issued a call for 125,000 volunteers, and the equipment of army and navy was vigorously pushed. The first action of importance was the naval battle in Manila Bay. At daybreak on May 1 Commodore Dewey, in command of the Asiatic squadron of the United States navy, entered the harbor. His squadron consisted of the cruisers *Olympia* (flagship), *Raleigh*, *Baltimore* and *Boston* and gunboats *Concord* and *Petrel* and the revenue-cutter *McCulloch*, with two transports. Here he met the Spanish fleet, consisting of the *Reina Cristina*, *Castilla*, *Don Antonio de Ulloa*, *Isla de Luzon*, *Isla de Cuba*, *Gen. Lezo*, *Marquis de Duero*, *Cano*, *Velasco*, *Isla de Mindanao*, some small gunboats and a transport. The result of the battle was the entire destruction of all the Spanish vessels and the silencing of the land-batteries. Commodore Dewey did not lose a ship nor a man, while the Spanish lost their entire fleet and from 600 to 700 men.

Spain sent to the defense of Cuba a fleet under command of Admiral Cervera (*q. v.*), which took a secure position in the harbor of Santiago (*q. v*). The city was also garrisoned by a Spanish army under General Linares. This city and harbor thus became the objective point of American attack.

The American fleet, under Admiral Sampson (*q. v.*), being unable to enter the harbor, which was thoroughly protected by fortifications, took position before the entrance, to prevent egress of the Spanish fleet. An American army of 15,000, under Major-General Shafter (*q. v.*), landed at Baiquiri, near Santiago, June 23. Advancing, they encountered a Spanish force at Las Guasimas on June 24, and a sharp engagement was fought, the enemy being driven back. On July 1 a severe and decisive battle was fought on the heights of San Juan and El Caney, overlooking Santiago, resulting in the defeat of the Spaniards. General Linares was wounded. General Vara del Rey, second in command, was killed, and the command of the Spanish forces, which withdrew within the fortified lines of the city, devolved on Gen. José Toral.

On July 3 the Spanish fleet under Admiral Cervera attempted to escape from the harbor of Santiago. As the vessels appeared in line they were pursued by the *Brooklyn*, the *Oregon*, the *Iowa* and the *Texas* of the American squadron and the converted yacht *Gloucester*. The Spanish ships *Maria Teresa*, *Almirante Oquendo* and *Vizcaya* were within a few minutes forced ashore and surrendered. The *Cristobal Colon* made a desperate attempt to escape, but was run ashore and sunk about 60 miles from the mouth of the harbor. The two torpedo-boat destroyers, *Furor* and *Pluton*, were wrecked within four miles of the harbor. Admiral Cervera, Captain Eulate and more than 1,300 officers and men were taken prisoners. The loss of life on the Spanish vessels was large, while on the American fleet only one was killed. None of the American vessels was injured seriously in the engagement.

On July 17 General Toral surrendered to General Shafter his army and the city and province of Santiago de Cuba, which embraced all eastern Cuba. An American army under General Wiles landed on the island of Porto Rico at Guanica, July 25, and advanced toward San Juan, occupying various points without serious fighting. On Aug. 12 a peace-protocol, suspending hostilities and providing for the appointment of commissioners to treat of peace between Spain and the United States, was signed at Washington, the French minister, M. Cambon, acting in behalf of Spain. The American troops, under General Merritt and the fleet under Admiral Dewey made a combined attack on Manila, August 13, and after six hours' fighting the Spaniards surrendered the city with 7,000 prisoners.

The peace-commissioners appointed by Spain and the United States met at Paris, Oct. 1. The United States commissioners were William R. Day of Ohio, Senators William P. Frye of Maine, Cushman K. Davis of Minnesota and George Gray of Delaware, with Mr. Whitelaw Reid of New York. After lengthy deliberations a treaty of peace was signed, Dec. 10, 1898. By this treaty Spain relinquished all claim of sovereignty over or title to Cuba, and ceded to the United States Porto Rico, Guam and the Philippine Islands; the United States agreeing to pay to Spain the sum of $20,000,000. The close of the war, which lasted only 113 days of actual hostilities, left Spain with no colonial possessions in the western hemisphere. See PHILIPPINE ISLANDS and PORTO RICO. See *History of the Spanish-American War* by H. Watterson.

Sparks, Ja'red, an American historian, was born at Willington, Conn., May 10, 1789. He studied at Harvard, settled as a Unitarian minister at Baltimore, and finally became editor of *The North American Review*. He was ten years a professor of history at Harvard, and for four years its president. His writings include *John Ledyard, Gouverneur Morris* and *Library of American Biography*, in ten volumes. He edited the *Works of Benjamin Franklin*, the *Writings of George Washington* and *Correspondence of the American Revolution*. He died at Cambridge, Mass., March 14, 1866. See *Memoir* by G. E. Ellis.

Spar'row, any one of various small birds belonging to the finch family. They are plainly colored and usually have their plumage streaked with brown, black, gray and rusty. About 30 common varieties are found in the United States, and among them are a number of good singers. They are hardy birds, feeding on seeds, and some kinds are to be seen in any month of the year. Some kinds go south at the approach of winter, others are permanent residents, and still others come from the far north, where they nest, to spend the winter in the United States. The song-sparrow is one of the commonest and rears three broods a year. The chippy is very common about our yards and houses. The most persistent is an imported bird — the common European house-sparrow or English sparrow, which was introduced into the United States about 50 years ago. Although destroying many caterpillars, it drives other birds before it and has become a nuisance and a pest, but they are too numerous and multiply too rapidly to be easily got rid of. Other well-known kinds are the fox-sparrow, swamp-sparrow, tree-sparrow, field-sparrow and the white-throated sparrow.

Sparrow-Hawk, a small falcon, abundant in the United States. It is about 11 inches long, with a tawny plumage, marked with bluish and black, a rusty-colored crown and a chestnut tail. There is considerable variation in its plumage. Notwithstanding its small size, it is one of the most active and courageous of birds. The sparrow-

hawk is the American representative of the European kestrel, which is a larger but similar bird. It feeds upon mice, grasshoppers and other insects. Its nest is usually in a hollow tree.

Spar'ta, the ancient Lacedæmon, the famous Greek city, was in the southern part of Greece on the Eurotas, about 20 miles from the Mediterranean. It was shut in by mountains, one, Mt. Taygetus, rising 8,000 feet; and the valley was so easily defended that it was not regularly fortified until 195 B. C. The city had few fine buildings; the Acropolis was a steep hill with a temple to Athena on its summit, and the white marble theater was one of the largest buildings. The city was formed from several scattered hamlets, and was governed by two kings, whose powers were equal, and who at first were priests, judges and generals as well as rulers. There were three classes of citizens; the Spartiatai or governing class, the Perioikoi, who were free but had no voice in matters of state, and the Helots or slaves, who were bound to the soil, cultivating it for its owners, and were also employed in war. The greatness of Sparta is due to the laws of Lycurgus, which made it a nation of soldiers. There is some doubt resting on the received traditions of Lycurgus, but there certainly was a very ancient legal code, dating back to 825 B. C. The citizens, according to this code, lived only for the state, and children were under the public care. If deformed or weak, they were not allowed to grow up; if healthy, they were taken from the mother when seven years old, and drilled in military exercises, in habits of endurance and skillfulness and in speaking short sentences, to the point, which last gave rise to the expression, "laconic," from the name of the province, Laconia. Their training is illustrated in the story of the boy with the stolen fox, who was applauded because he bore the torture of the desperate animal tearing his flesh rather than by crying out and confessing that he had stolen him. Between the ages of 20 and 60 all Spartans served in the army, and, though allowed to marry and to engage in business, ate and slept in the public barracks. The early struggles of Sparta with Messenia, Argos and Athens, gave Sparta the victory and made it the chief power in Greece, but its tyranny induced rebellion, and the Thebans under Epaminondas reduced Sparta to its old boundaries. The Macedonians still further cut off its provinces, and finally, with the remainder of Greece, it became a part of the Roman empire. The modern town of Sparta, founded by the Greeks in 1836, the capital of Laconia, occupies a part of the site of ancient Sparta.

Spartacus (*spär'tă-kŭs*), a leader in a revolt of Roman slaves, about 73 B. C., was born in Thrace. He was first a shepherd, then the head of a band of robbers, and when taken was sold to a trainer of gladiators at Capua. He escaped with 70 others and fled to the crater of Vesuvius. Here he was joined by many runaway slaves, conquered all forces sent against him, and sacked many of the cities of southern Italy. His army increased to 100,000 men, whom he sought to induce to march across the Alps and to seek their old homes, but the fever of revenge and conquest was upon them, and Spartacus continued his fight with the Roman authorities. At last he was defeated by Crassus in 71 B. C. while trying to seize the shipping at Brundusium, and was slain at Petelia.

Spar'tanburg, S. C., capital of Spartanburg County, on the Glen Springs, Charleston and Western Carolina and Southern railroads. It lies 94 miles northwest of Columbia, the capital, and 72 miles southwest of Charlotte, N. C. It is the seat of Converse College and of Wofford Methodist Episcopal College, and has a number of churches, schools and other public institutions. It has extensive cotton manufactories and has been called the Lowell of the South. This industry has greatly advanced the growth and prosperity of the city. Population 16,000.

Spathe (*spāth*), the very highly developed bract which invests the spadix. In Jack-in-the-pulpit it is tubular below, and spreads above into an overarching hood. In the calla lily it is very large, and beautifully white. The spadix with its spathe is characteristic of the Aroids, and in the numerous tropical forms the spathe is extremely varied in form and often brilliantly colored.

Spe'cie Payments in the U. S., Suspension and Resumption of (1861–79). In consequence of the Civil War and the beginning of the drain on the United States government to meet its current obligations in metallic money, the nation, following the action of the banks, suspended specie payments at the close of 1861 and resorted to the issue, in large sums, of legal-tender paper-money ("greenbacks" the notes were called) in lieu of gold and silver in the payment of debts and taxes. The suspension, which lasted until Jan. 1, 1879, had the effect of depreciating the national paper-currency to half its face-value in gold; though, when the war closed, the government, in pursuance of an honest financial policy, began to redeem its obligations with coin and stopped the issue of the U. S. legal-tender notes. This had its effect on the national currency, which began steadily to rise in value. The government finally grappled with the financial problem and solved it by announcing that on Jan. 1, 1879, the resumption of specie payments would take place. The government kept faith with its creditors and the nation on

the day specified, when, through the sale of bonds and the accumulation of surplus revenue etc., gold and silver were once more paid out. The result proved the wisdom of the government and banished all misgiving, for, when 1879 opened, only about 11 or 12 million dollars' worth of notes were offered for redemption, while the treasury at Washington had in its possession about ten or twelve times the amount in gold in its vaults.

Specif'ic Grav'ity. See DENSITY.

Specific Heat, a term used in the physical sciences and in engineering to denote *the quantity of heat necessary to raise the temperature of one gram of a substance through one degree centigrade at any given temperature.* This quantity of heat is known as the specific heat of that substance at that temperature. If we use the *calorie* as the unit of heat, an exactly equivalent definition of specific heat is the following: *The ratio between the amount of heat required to raise the temperature of any body one degree and that required to raise the temperature of an equal mass of water one degree.*

The following is a table of specific heats of some of the more common substances:

Aluminum	0.214	Tin	0.056
Sulphur	0.203	Iodine	0.054
Iron	0.114	Antimony	0.051
Copper	0.095	Mercury	0.033
Zinc	0.095	Platinum	0.032
Silver	0.057	Lead	0.031

See HEAT.

Spec'tacles are instruments used for aiding the sight. They are said to have been invented in the 13th century. The first ones were very clumsy, and there was very little improvement until the beginning of the 19th century. Spectacles are worn for strengthening the vision, when it is weakened by old age, or to remedy any natural defect, such as nearsightedness, and also to protect the eye from too strong light. The glasses or lenses used should be made of the best of glass and carefully ground, though sometimes they are made from rock-crystal and called "pebbles." The glasses should be very carefully selected to accomplish the purpose intended, it being often necessary to fit each eye separately. For short sight or nearsightedness the lens is concave, and the weakest glass that will permit distant objects to be seen should be used. For the weakness of old age, which is farsightedness and is first noticed by one's holding a book farther off in reading etc., the lens is convex, and the strongest glass should be used.

Spec'trograph. See SPECTROSCOPY.

Spec'troscope. See SPECTROSCOPY.

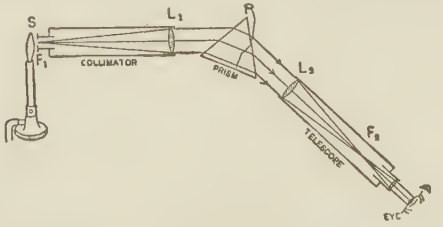
Spectroscopy (*spĕk-trŏs'kŏ-pў*) is a science which has for its object the determination and description of the various radiations which bodies emit, reflect and absorb. It is to be carefully noted that spectroscopy does not end in the observation of phenomena, but includes also the description of these phenomena in a manner which is at once the simplest and most complete.

METHOD OF SPECTROSCOPIC SCIENCE

The examination of a body by means of the spectroscope includes four steps. These are *the Production of Radiation; the Separation of the different Radiations; the Recording of the Radiations;* and *the Comparison of the Radiations.* We shall consider the subject from these four points of view.

A. What the spectroscope receives and analyses is radiant energy. It follows naturally, therefore, that *the first step* in examining the spectrum of any body *is to make that body a source of radiant energy.* In many cases this step has already been performed for us. Thus the fixed stars and the gases in which lightning-discharges occur are already rendered self-luminous. All we can do, therefore, is to *observe* their spectra; we cannot *experiment* upon them. Bodies at the surface of our earth can generally be made to radiate energy (1) by heating them, as in the case of a red-hot poker; (2) by passing an electric current through them, as in the case of the Plücker tube; (3) by means of chemical combination, as in the case of the Bunsen flame; or (4) by means of luminescence, of which fluorescence and phosphorescence are examples. As to just how and why these processes cause bodies to emit radiant energy very little is known.

B. Passing now to the second step, namely, *the separation of the radiant energy of one wave-length from that of the others,* this is the peculiar function of the spectroscope, and is usually accomplished in one of two ways: either by interposing in the path of the ray a prism which impresses upon each ray of different wave length a different direction; or by placing in the path of the rays a diffraction-grating which accomplishes the same thing. (See PRISM and DIFFRACTION-GRATING.) Of these two methods, the first was introduced by Newton about the middle of the 17th century, and the second by Fraunhofer near the beginning of the 19th century. The ordinary prism-spectroscope, shown in figure 1, is



A PRISM-SPECTROSCOPE ADJUSTED TO VIEW ONE PARTICULAR COLOR IN THE SPECTRUM

generally made up of three parts, viz., a prism and two astronomical telescopes. One of these telescopes is used to render the rays which fall on the prism parallel to each other, and is therefore called the *collimator*. The other telescope is made movable so that it can be turned into the proper direction for observing any desired color, and is, therefore, called the *view-telescope*. A *grating* spectroscope is essentially of the same construction (see figure 2) except that the dispersion, *i. e.*, the separation, of the rays is produced by the grating at G, instead of by a prism. The radiant energy is here admitted through the small narrow opening at S_2, called the *slit*.

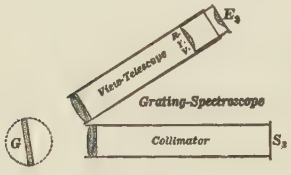


FIG. 2

An image of this slit is produced in the focal plane of the view-telescope, and in the ordinary spectroscope is there examined by means of an eyepiece. But, if we place a small camera at the end of the view telescope in such a position that the photographic plate will lie in the focal plane of the telescope, we can then obtain a photograph of these images. Such an instrument is called a *spectrograph*.

Among the most powerful spectroscopes known must be mentioned the curved grating instrument devised by Rowland. For the best account of this see Kayser's *Handbuch der Spectroscopie*. In the same class must be mentioned Michelson's echelon spectroscope, which is well-described in Drude's *Lehrbuch der Optik*.

C. Passing now to *the manner in which spectra are recorded*, this depends partly upon the portion of the spectrum under examination and partly upon the purpose of the examination. If it is merely the appearance of a line, a glance of the eye may suffice, provided the line is in the visible part of the spectrum.

But in the ultraviolet part of the spectrum photography is practically the only available means for obtaining a record. In the infrared portion of the spectrum we cannot see and cannot easily photograph what is there; so that here the radiomicrometer or bolometer or radiometer must be used. In general, photography is the best and most easily worked method whenever it is applicable.

D. Comparison of Spectra. Let us suppose now that by some means we have analyzed the radiation from a certain body and have recorded its spectrum. The next step in the process is to apply this information to the purpose for which it was obtained. This last step — the interpretation of results — perhaps is the most important one of the four, and the one which demands, in its execution, the largest measure of care and experience. After a spectrum is once obtained it becomes generally necessary to compare it (1) with itself when the radiation is produced under different conditions; (2) with itself when recorded in another way; (3) with the spectra of other bodies; (4) with some spectrum which has been predicted by theory; or (5) with a standard scale of wave-lengths; that is, with an ideal spectrum in which each line differs from its neighbor by one of the units in which wave-lengths are measured.

HISTORY OF SPECTROSCOPY

A bare outline of the steps by which this science has reached the high degree of perfection which it to-day possesses would be something like the following:

1. Newton, by his careful study of the prism, gave a fairly complete answer to the question of separating the various radiations.

2. Young and Fresnel, by establishing the wave-theory of light along the lines laid down by Huygens, placed spectroscopy upon a sound scientific basis.

3. Fraunhofer, by inventing the diffraction-grating, greatly increased the power and simplicity of the instrument.

4. Kirchhoff and Bunsen (1859) showed that each chemical element emits a characteristic radiation and, thereby, established the science of spectrum analysis.

5. Rowland, by the perfection of the plane grating and by the invention of the curved grating, as well as by his superb published spectra of the sun and elements, revolutionized the entire science and gave it a precision hitherto undreamed of.

6. Kayser and Runge, by their study of the spectra of the elements, have shown that there is an order, and not a chaos, running through the thousands of lines already mapped.

7. Michelson (1890–1900) has shown us how a single line in any spectrum may be analyzed and studied in detail; and has thus, at once, multiplied the power and the problems of the science. This he has accomplished by the invention and use of the interferometer and the echelon spectroscope. Kayser's *Handbuch der Spectroscopie* is incomparably the best treatise ever written on this subject. HENRY CREW.

Spec′trum. If a prism or a diffraction-grating be interposed in the path of a beam of white light, it will, provided the beam of white light be small, spread this beam out into a colored band in which the colors are arranged in the following order: *red*, *orange*, *yellow*, *green*, *blue*, *violet*. This colored band is called the *spectrum* of white light.

If, instead of a pencil of white light, we had passed through the prism a pencil of light from the Bunsen flame, it too would

have been separated into its constituent colors, in this case *green*, *blue* and *violet*, which are the spectrum of the Bunsen flame. If an electric arc had been employed, we should have obtained the spectrum of the electric arc, even though a large part of the radiation from the arc is invisible — has no color — and must be detected by the photographic plate.

So we define the spectrum of any body as the *ensemble* of its radiations, visible and invisible, arranged in the order of their wave-lengths. See SPECTROSCOPY.

Spectrum Anal'ysis, the act of ascertaining the character and composition of luminous bodies by causing a ray of light from the body to pass through a prism, each substance in the spectrum having its own characteristic system of lines — as in a star, a planet or any heavenly body in a state of incandescence or in metals submitted by the chemist to great heat. See SPECTROSCOPY.

Speculum (*spĕk'ū-lŭm*) **Metal** is an alloy composed of 126 parts of copper and a little over 58 of tin, which is used for the mirrors or *specula* of telescopes. It is very brittle, will take a fine polish, and does not tarnish easily. A silvered glass is, however, taking its place, being just as good and less expensive.

Speke (*spēk*), **John Hanning,** an African explorer, was born on May 4, 1827, in Somersetshire, England. At 17 he entered the Indian army, where between his periods of military service he collected specimens in natural history and planned available routes of travel. In 1857 he was sent out with Burton by the Royal Geographical Society to find the great lakes of Central Africa. Speke, when alone, discovered the Victoria Nyanza, and in 1860, while associated with J. A. Grant, he returned and explored its coasts and followed the river until he was satisfied it is the Nile. It was disputed, however, by Burton and other travelers, and Speke made arrangements for a public discussi n with Burton at Bath. But on the morning of the day set, Sept. 15, 1864, he accidentally shot himself. His writings are *Journal of the Discovery of the Source of the Nile* and *What Led to the Discovery of the Source of the Nile.*

Spell'ing. The art of orthography as taught in the elementary school. It formerly was closely associated with reading, but has come to be treated in connection with written composition. This is due to the fact that people do not ordinarily spell, except when they are giving written expression to their thoughts. The ideal selection of words would be from those most commonly used in composition, rather than from reading, which represents, for the child, a much larger vocabulary. The subject, as a separate school-study, usually begins in the second school-year and extends through the elementary school.

Spelling represents the attempt to associate the actual order of letters which go with a meaning and its spoken symbol. In perfect spelling the child has a fixed association of three elements: The meaning of the word, the pronunciation of the word and the spelling of the word. The presence of any of these factors ought immediately to recall the other two. All should be *presented together* so as to be *recalled together.*

(1) There are four general ways of getting the meaning of a word: (a) By experience, through action, observation, conversation etc., (b) by the context of surrounding language, (c) by the teacher telling the child and (d) by the use of the dictionary. (2) The pronunciation may be obtained by three typical methods: (a) By example, whether it be by the chance example of one's fellows or by the model of pronunciation deliberately given by the teacher, (b) by phonetic translation from the printed word, where either the letters (d-ē-r-ā-n-g-ȩ-m-ĕ-n-t), syllables (de-range-ment) or phonograms (de—r-ange—m-ent) are changed into sound and combined, and (c) by the use of the dictionary, where the sound of a letter in a familiar word at the bottom of the page is transferred to the word under investigation through the similarity of diacritical marks in both. (3) The correct order of letters is usually found in one of four general ways: (a) By having the child copy the word from a book or from the teacher's spelling, (b) by using the dictionary, which is *very difficult* for the child who does not know the spelling and, therefore, has to guess at its beginning until he finds the word, (c) by looking attentively at the word (visualization) and then memorizing it and (d), when the word is very regular and pronunciation will suggest the order of letters, by translating his pronunciation into letters.

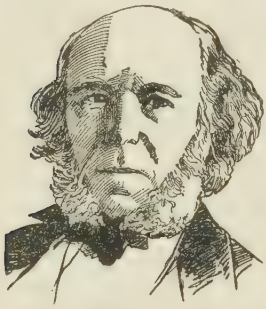
In actual teaching there are many ways of presenting the spelling of the word, with its pronunciation and meaning. The teacher will usually (1) revive the meaning carefully, (2) have the child look attentively at the written word (visual impression), (3) have him copy it carefully (motor impression), (4) pronounce it carefully for the child to hear (auditory impression); and (5) then have the child speak it (motor impression).

The spelling must be practiced so as to fix the order of letters in his memory. This may be done (1) by the spelling of single words in written lists, (2) by spelling the single word aloud, pronouncing the same before and after (dog, d-o-g, dog), (3) by spelling the word in a sentence. This spelling of words in sentences may be (a) in copying, (b) by taking down dictation and (c) by writing the words in any composition where the child is trying

to express his own thoughts. The last-named method is the best test of ability to spell.

With the usual elementary-school child, below the seventh or eighth grades. it is now preferable to teach homonyms (to, too) separately and without reference to each other. Word-analysis and word-study as aids to spelling are passing from the course of study. They are good ways of helping the child to guess at the spelling of a word from its linguistic derivation when there is no dictionary available, but good spelling in the elementary school now demands a precise, direct and authoritative spelling made habitual by practice.

Spen'cer, Herbert, an English philosopher, was born at Derby, April 27, 1820.



HERBERT SPENCER

His father was a teacher, and the son inherited a taste for natural science, keeping collections of insects and making drawings of them as a boy. His first work was that of a civil engineer, in which he was engaged for about eight years, publishing articles in *The Civil Engineers' and Architects' Journal.* From 1848 to 1853 he was an editor of *The Economist.* His first important publication was *Social Statics* in 1850. His great plan was the working-out of a system of philosophy based on the doctrine of evolution, the theory that the world is the result of a long series of changes, produced by force acting on matter and resulting in motion. In applying evolution to the study of man in society Spencer employed assistants to collect and arrange all sorts of facts in regard to customs, worship, government etc. of savage tribes, ancient and modern races. His philosophical writings are very numerous, *Principles of Psychology, First Principles, Principles of Biology, Data of Ethics* and volumes of essays being among the best known. His brilliant power of drawing conclusions from a vast array of facts, his great knowledge of science and his wealth of illustration made him popular as well as gave him a high position among philosophers. (See FISKE, JOHN.) His most popular works are a small book on *Education* and *The Study of Sociology.* He died on Dec. 8, 1903.

Spencer, Mass., an early settled town embracing a group of villages in Worcester County, formerly was a part of Leicester. It is on the Boston and Albany Railroad, ten or twelve miles west by south of Worcester. Here are Sugden Library, an industrial home for children, Spencer Park, other parks, many churches, schools and other public buildings. Industries include wire-articles, woolen, and underwear goods, boots and shoes. Population 7,627.

Spenser, Edmund, an English poet, was born at London about 1552. He studied at Cambridge, obtaining considerable knowledge of Latin and Greek literature, as is seen in his works, and making a friend of Gabriel Harvey. In 1579 appeared his first work, *The Shepherd's Calendar,* the first note of the great Elizabethan poetry. It was dedicated to Sir Philip Sidney (*q. v.*), one of his stanchest friends, whose acquaintance he had made probably through Harvey. Through Leicester, Sidney's uncle, doubtless, he was appointed secretary to the lord-deputy of Ireland, which thus became his home. The country was in rebellion, and Lord Grey suppressed it so cruelly as to be recalled, and Spenser learned the lesson of massacre and extermination, which he afterward advocated, making his name hateful to the Irish nation. His great work, *The Faerie Queene,* was begun in England, but the larger part was written in Ireland. The first three books were published in 1590 and brought great fame and a small pension, but no political preferment, as he had hoped. Two more cantos and two stanzas were published in 1596, leaving the poem unfinished. The first two books are those usually read and give the best idea of the beauty of the poem, which places him in the first rank of English poets. Of his other poems, *Colin Clout's Come Home Again* perhaps is the best known. In 1598, after returning from London to his Irish home at Kilcolman Castle, in an insurrection his home was burned, and he fled with his family to London, which he reached exhausted and destitute. There he died soon after at a tavern in King Street, Jan. 13, 1599. He was buried beside Chaucer in Westminster Abbey. See *Spenser and His Poetry* by Craik and *Spenser* by Church, in the English Men of Letters Series.

Antheridium of a Fern discharging the Coiled Multiciliate Sperms.

Sperm (in plants), the male cell which unites with the egg in the process of fertilization. Antherozoid and spermatozoid are terms applied to the

same body. In all groups of plants, except the seed-plants, the sperm is chiefly a ciliated, free-swimming cell. In *Thallophytes* the cilia are variously disposed. In *Bryophytes* each sperm has a pair of cilia at its anterior end. In *Pteridophytes* the body of the sperm is large and spirally coiled, tapering into a long, slender beak which bears numerous long cilia. In *Spermatophytes* ciliated sperms do not occur, except in Cycads and Ginkgo, the male cells being transferred through pollen tubes.

Spermaceti (*spĕr'mȧ-sē'tĭ*) is a waxy substance obtained from the oil found in the head of a sperm-whale. The oil in the head of an ordinary-sized whale will fill 12 barrels. The oil is drained off, and the spermaceti washed with hot water and weak boiling lye. It is a white substance, looking like wax, without taste and with very little odor. It is used for candles and in medicine.

Sper'mary, the male organ of plants, that is the organ which produces the sperms. It is the same as *Antheridium* (*q. v.*), but is substituted for it by those who wish to emphasize the fact that an antheridium holds no relation to the anther of flowering plants.

Spermatophytes (*spĕr'mȧ-tō-fīts*), the highest of the four great divisions of the plant-kingdom, characterized by the production of seeds. The name means seed-plants. This great group has received numerous other names, as flowering plants, Anthophytes, Phanerogams, Phænogams, Phenogams, Siphonogams etc. The seed-plants form the most conspicuous vegetation on the earth's surface, and are the plants most usually noticed. They have been evidently derived from *Pteridophytes*, differing from them chiefly in the production of seeds. The condition which has resulted in the formation of a seed is the presence and retention of a single megaspore (embryo-sac) in the megasporangium (ovule). The two great lines of spermatophytes are gymnosperms and angiosperms. In gymnosperms (naked seeds) the ovules and seeds are exposed upon the face of the open scale, as in pines, spruces, cypresses, junipers etc. In angiosperms (inclosed seeds) the ovules and seeds are inclosed in an enveloping carpel or group of carpels. The gymnosperms are a very ancient race, being represented only by about 400 living species; while the angiosperms are modern, containing more than 100,000 described species. See GYMNOSPERMS and ANGIOSPERMS.

Spermatozoid (*spĕr'mȧ-tō-zō'ĭd*) (in plants). See SPERM.

Sperm-Whale. See WHALE.

Sphagnum (*sfăg'nŭm*). A genus of mosses known as the bog-mosses. They are large and pallid forms, which occur in great masses in boggy regions, especially at the north. The sphagnum-bogs are great peat-formers, and associated with the sphagnums are many strange seed-plants, as carnivorous plants, the rarer orchids, heaths etc. This association of plants of strange habits seems to be due to the fact that the waters of the bog are poor in nitrogen-containing salts, and only those plants which have learned to endure such conditions are found. The genus sphagnum is so peculiar that it forms one of the two great groups of mosses, the other and much larger group being called the true mosses. Sphagnum is an intermediate form, combining characters which belong to liverworts and true mosses. See MUSCI.

Sphinx, The. The sphinx at Gizeh, the oldest of known statues is a colossus having the head of a man and the body of a lion. It is chiseled from the living rock, 1,800 feet distant from the great pyramid. Some say it was hewn by the Hor-shesu, servants of Horus, before the reign of King Mena of the first dynasty and was in need of repair at the time Khufu built the great pyramid. The sphinx faces east that he may be the first to catch sight of Ra, his father, the rising sun. It was known to the ancient Egyptians as Hu or Seheps, and to the "sons of the desert" it was Abul-Hoe (father of terrors). Binion, in *Ancient Egypt or Mizraim* gives the measurements as follows: Height of head from top of head to bottom of chin 19 ft.; horizontal diameter on level of forehead 23 ft; circumference at level of forehead 72 ft.; horizontal diameter near broadest part of wig 29 ft.; circumference near broadest part of wig 91 ft.; height of neck 5 ft.; horizontal diameter 22 ft.; circumference of neck 69 ft.; total height, present state (Bey) 65 ft.; ear 6 ft. 5 in.; nose 5 ft. 10 in.; the mouth 7 ft. 8 in.; face, widest part across, 13 ft 7 in.; whole length of body 140 ft.; outstretched paws 50 ft. The execution of this masterpiece shows the product of a mature people; of a nation that had been in development for generations and generations. Notwithstanding the devastation that has befallen this powerful statue — the lower part of the head-dress fallen; the neck diminished until the massive head seems almost to totter on the verge of downfall; the nose and head broken off by fanatics; and the paws and breast that were restored by the Ptolemies and the Caesars also in a state of decay — it still is rapt in profound thought and tranquillity behind which great strength and power seem to live in perfect command. G. Maspero, in speaking of the great sphinx in his *Manual of Egyptian Archæology*, says: "The art which conceived and carved this prodigious statue was a finished art, an art which had attained self-mastery and was sure of its effects."

Other sphinxes are found in Egyptian ruins of a later date during the age of temple-building, and are much smaller and of three kinds, namely, androsphinx, which

has the head of a man; criosphinx, the head of a ram; and hieracosphinx, a hawk's; yet all have the body of a lion. These were employed along the avenues leading to temples and along the passages that joined together the sacred fortresses which usually outnumbered the temples in every city and were used as the last resort in an attack from enemies. Consult Maspero's *Manual of Egyptian Archæology;* Binion's *Ancient Egypt or Mizraim;* and Hamlin's *History of Architecture.*

Spice Islands. See MOLUCCAS.

Spices, certain vegetable substances, used for flavoring food. They are the product usually of tropical countries, and are brought mainly from the east, though some are found in the tropical regions of America. They come from different parts of the plant, as ginger from the root, pepper and nutmeg from the fruit, cinnamon from the bark, and cloves from the bud. Ginger, cultivated in the East and West Indies, is prepared for the market by scalding the roots in boiling water or by scraping the roots and then washing. The first process makes white ginger, and the last black ginger. Preserved ginger is the young rootstocks preserved in syrup. Nutmeg and mace are obtained from the fruit of trees or shrubs native to Asia, Madagascar and America. Nutmeg is the kernel or seed of the fruit, which is yellow and looks like a pear that is somewhat round, and has rather hard flesh. Around the nut is a network of fibers called mace, and within the thin brown shell is the nutmeg. The mace is blood-red when fresh, but when dried in the sun turns a light brown. It is sprinkled with seawater to preserve it and pressed flat. Both mace and nutmegs yield an oil and are used in medicine as well as in food. The trees do not bear fruit until eight or nine years old. Cinnamon is the inner bark of the cinnamon-tree. The tree is a native of Ceylon, and grows also in China and South America. The bark is taken from the tree in strips about 40 inches long, and gathered into bundles, which makes it ferment so that the outside bark is easily peeled off. It is dried, and rolled up. The best cinnamon comes from Ceylon. Cloves (called so because they look like small nails, from *clavus*, the Latin for nail) is the flower-bud of the clove-tree. The tree is a native of the Moluccas, grows about 40 feet high, and lives to be 100 or 200 years old. The spice is the blossom, and is gathered before it is quite open and dried in the shade. The tree does not grow well out of its native soil. The oil of cloves is used in medicine. Pepper is a berry which grows on a climbing shrub. It is about as large as a pea, and there are 20 or 30 in a cluster. They are yellow when ripe, black when dried. Black pepper is made by grinding the whole berry, white pepper by rubbing off the outer covering before grinding. Cayenne pepper is the pod of a plant, and was first brought from Cayenne in South America. Mustard is obtained from the seeds of a plant, three varieties of which are used — the black found in Europe, the white in Europe, Asia and the United States, and a weed, called the wild mustard, found in England and the United States. The seeds of the wild mustard are used only to mix with the others. The flour made from the seeds is often adulterated, but mixing it with wheat-flour is allowed, as it keeps better and is less bitter and stinging.

Spi'ders, a distinct group of animals related to scorpions, daddy-long-legs and mites. United with the latter, they make the class *Arachnida*, which is related to the classes of insecta, crustacea and myriopoda. Their body is separated into two parts, a combined head and thorax and an abdomen. There are four pairs of walking-legs on the thorax, which distinguish them from all insects, the latter having three pairs of legs. The head carries poison-jaws, mouth-parts and, usually six or eight simple eyes. The arrangement of the eyes is an aid in classifying spiders. They breathe by means of air-chambers on the abdomen, which are called lungs. These number two or four, and, when the former, there also are air-tubes in the body. The spinnerets from which the thread is spun are little knob-like processes on the under side of the abdomen near its tip. There are two, three or four pairs with numerous horny tubes opening upon them. The substance of the thread is fluid and hardens on contact with the air. It is formed within numerous glands, one of which opens in each horny tube. Fluid issues from the various tubes and is usually united into a single thread. Some spiders, in place of spinning webs, send into the air a slender thread which becomes longer and longer, and, finally, is sufficient to act as a float. They let go their hold and go sailing through the air often for miles, supported by this floating thread, and ballooning spiders sometimes are seen far out at sea. Spiders lay eggs in silken bags or cocoons, which are sometimes carried about by the female and at other times attached to objects in sheltered places. The young that hatch from the ball dragged by the mother climb up her back, and for a time she thus carries them about. The kinds of spiders and the webs they form are varied. The cobweb of the house-spiders is most familiar, though there is a much larger number of webs to be found out-of-doors. The common garden-spider with its geometrical web is well-known. The large black and yellow spider is frequently seen in the autumn. The interesting jumping-spiders are common on plants, logs, fences and sides of buildings. The common grass-spider makes its web in the

CRAB SPIDER.

form of a funnel in the grass. Some spiders of small size build no webs, but wander about and leap upon their prey like tiny tigers. The trap-door spiders inhabit tubular nests in the ground provided with a trap-door to close the entrance; several species are found in our southern and southwestern states. Some triangular spiders, with sharp spines projecting from their bodies, are among the most curious forms. Among the largest spiders of warm and tropical countries is the tarantula (*q. v.*), a large, hairy, fierce-looking spider whose bite is poisonous but rarely, if ever, fatal to man. All have poison-glands, but very few are harmful to man. There also are crab-spiders (*mygale*), measuring six or seven inches across, which prey upon birds and other small animals. Some of these inhabit our western plains and others are found in tropical regions of the Old World. The king-crab is usually regarded as belonging to the same group as the spiders. See McCook: *American Spiders and Their Spinning Work* and Emerton: *The Common Spiders of the United States.*

Spike, an inflorescence in which the flowers are sessile, or nearly so, and upon an elongated axis. See INFLORESCENCE.

Spike'let, small spikes which form a part of a larger inflorescence, as in grasses. See INFLORESCENCE.

Spikenard (*spīk'nārd*) or **Nard,** a perfume obtained from a small plant, a native of India. It was much prized by the ancients and used in baths and at feasts. The odor is not generally liked by modern nations, and it is now used more in medicine than as a perfume. Some other plants of the same order, used in the place of spikenard, grow on the Alps and other mountains of southern Europe, where the peasants gather them from the rocks.

Spine, a rigid, sharp-pointed outgrowth from plants. Ordinary spines are modified branches and sometimes leaves, which have become stunted on account of deficient food-supply. They are most common in plants of arid regions. Sometimes, however, hairs become very rigid and sharp, in which case they are said to be spiny.

Spin'ner, Francis Elias, an American official, was born at Mohawk, N. Y., in 1802. He was in Congress from 1855 to 1861, but is best known as treasurer of the United States for 14 years. In this capacity his signature was placed on all the paper-money of the United States, and the very curious autograph, defying imitation, was known all over the world. He retired in 1875, and died on Dec. 31, 1890.

Spin'ning, an old-time household industry, performed by the hand, by means of the spindle and distaff, but now a process extensively performed by machinery, and consisting of drawing out and twisting into thread wool, cotton, flax, silk and other fibrous substances, suitable for sewing purposes or weaving. The operation was first performed mechanically by the spinning-machine or jenny, invented in England about 1767 by James Hargreaves (*q. v.*), a Lancashire weaver, by the operation of which a number of threads were spun together. To this spinning-jenny was later on invented and attached a bobbin for winding the yarn by a motion separate from that of the spindle. Still later the jenny was followed by the spinning-frame and the spinning-mule, which ultimately superseded the jenny in cotton manufacture. In England Manchester is the chief seat of the spinning and cotton-making industry; while in America there are now not less than 25 million spindles in operation in the great textile factories spread over, chiefly, the eastern portion of the United States.

Spinola (*spē'nō-lă*), **Ambro'sio,** Marquis of, a great Italian soldier, was born at Genoa in 1571. With his brother he raised a force of 9,000 men whom he kept at his own expense. He served first in the Netherlands. His reduction of Ostend, which had been besieged two years, gave him a great reputation, and he was placed at the head of the Spanish and Italian troops in the Netherlands. His great antagonist was Prince Maurice of Nassau, and in their long struggle neither could gain any advantage. After an armistice of 12 years, beginning in 1609, with the renewal of the war Spinola was once more opposed to Maurice, who died, however, before the walls of Breda. The taking of Breda in May, 1625, after a siege of ten months, was Spinola's last victory. He had spent his fortune in maintaining his troops, but his claims were not acknowledged by the Spanish government, and vexation from this shameful neglect is said to have hastened his death, which took place in Piedmont, Sept. 25, 1630.

Spinoza (*spĭ-nō'zä*), **Ben'edict,** the great Dutch-Jewish philosopher, was born at Amsterdam, Nov. 24, 1632, of Hebrew parentage. His philosophical studies gradually drew him away from the faith of Israel, and he was formally excommunicated in 1656, when he changed his name, which was Baruch, to Benedict. In common with all Jewish youth he had been taught a trade, in his case that of polishing lenses, by which he now supported himself. At the death of his parents he contested with his sisters his right to the inheritance, but, when he had obtained it, took only one bed. He moved to Leyden and then to The Hague, where he was offered a professorship at Heidelberg, Germany, if he would teach nothing opposed to the received religion. He declined the position, the offer of money by a wealthy friend and a pension, conditioned on dedicating

one of his works to Louis XIV. Yet he was living on only a few cents a day. Separated from his friends, suffering from ill-health and want and harassed by continual persecution, he continued his life of study until his death on Feb. 21, 1677. His philosophical system was based on that of Descartes, and is mainly contained in his *Ethics*, which was not published until after his death. "The world has produced no intellect more profound than that of Spinoza, and Spinoza has produced no book which can be compared with his *Ethics*," which attracted the admiration of such men as Goethe, Fichte, Schelling and Hegel and gave character to a school of philosophy. During his life Spinoza published only two works: *Abridgement of the Meditation of Descartes* and a *Treatise on Theological Politics*. Consult H. Smith's *Spinoza and His Environment* and the *Life* by Pollock.

Spi'rea, a genus of plants of the rose family. The species scattered throughout the temperate parts of the northern hemisphere consist of small, unarmed shrubs or perennial herbs, with racemes or corymbs of white or reddish flowers. North American, Indian and Japanese shrubby species are in cultivation. Two very fragrant British species are known by the name of meadow-sweet. Dropwort, found in Sweden, has tuberous roots which are somewhat nutritious and are ground and made into bread. Hardtack, a species in the United States, is used as a tonic and astringent.

Spirogyra (*spī'rō-jī'rà*), a genus of plants belonging to the green algæ, which has received its name from the fact that the very conspicuous chloroplast passes as a broad spiral band from one end of the cell to the other. The species are filamentous forms, and are very common in frothy masses in stagnant fresh water and about springs, being commonly known as pond-scums or frog-spittle. Spirogyra belongs to the conjugate forms, its filaments becoming connected in pairs by outgrowing tubes at the time of fertilization. See CHLOROPHYCEÆ.

Spitzbergen (*spĭts-bĕrg'en*), a group of islands in the Arctic Ocean, 400 miles north of Norway. They are covered with ice, with sharp projecting peaks, which give them their name of Spitzbergen, meaning Needle-like Mountains. On the western coast the climate is affected by the Gulf Stream, while the eastern coast is icebound and difficult of access. There is a scanty vegetation, with 40 species of plants; herds of reindeer, the arctic fox and the polar bear are found, with great swarms of seafowl. The longest day is four months, and the long night lasts from Oct. 22 to Feb. 22, in which the moon and stars and occasionally the *aurora borealis* are the only light. There are no permanent inhabitants, but the islands are visited by Norwegian walrus-hunters and scientific explorers. Consult Lord Dufferin's *Letters from High Latitudes*.

Spof'ford, Ainsworth Rand, a librarian of the United States Congress, was born at Gilmanton, N. H., Sept. 12, 1825, and educated by private tutors. Early in his career he settled at Cincinnati, O., as a bookseller and publisher, and also became associate-editor of the Cincinnati *Daily Commercial*. In 1861 he became assistant to the librarian of Congress, and four years later was appointed librarian-in-chief. In 1897 he was succeeded by J. R. Young and later by Herbert Putnam. Mr. Spofford was an indefatigable compiler of the catalogues of the Congressional library, and for some years issued the *American Almanac*. He also interested himself in copyright matters, published a *Manual of Parliamentary Rules*, and edited the *Library of Choice Literature*, the *Library of Historic Characters and Famous Events* and the *Library of Wit and Humor*. He was one of the greatest librarians that ever lived and a marvel of learning and memory. He died on Aug. 11, 1908.

Spofford, Harriet Elizabeth (Prescott), an American author, was born at Calais, Me., April 3, 1835. *In a Cellar*, one of her first contributions to the *Atlantic Monthly*, attracted great attention. She has since published *The Amber Gods; Sir Rohan's Ghost; New England Legends; Azarian, an Episode;* and still is a frequent and popular contributor to the periodicals.

Spokane (*spō-kăn'*), **Wash.,** formerly called Spokane Falls, a city in the eastern part of the state, is the county-seat of Spokane County and is reached by the Northern Pacific, Great Northern, Oregon Railway and Navigation Company and Spokane and Northern and other railways. Spokane River, which runs through the city, is spanned by 23 bridges, and in a series of falls has a descent of 142 feet, affording splendid water-power. Even at extreme low-water these falls develop 15,000 electrical horse-power. This is utilized in numerous manufacturing plants and in generating electric power, which not only serves the city but is furnished to mines in Idaho, 100 miles distant. The famous silver-lead mines of Cœur d'Alene, Idaho, which produce over one fifth of the annual lead output of the world, are thus operated. This water-power lights the city, operates the mills, 98 miles of street-railways and 258 miles of interurban lines. Spokane is the mining-center of a wide region, and does a large business in handling the products of the mines and in furnishing miners' supplies. It is surrounded by heavy pine-forests, which produce a large output of lumber and make the city an important lumber-market. It also is the chief market

SPONGES SPREAD ON WHARF TO DRY

for the extensive grain-products of eastern Washington. The adjacent country is also rich in farm and dairy products, fruit and live stock, and has valuable quarries of granite. The manufacturing interests include lumber and lumber-products, machine-shops, foundries, flour-mills, cigars, crackers, soap, flour-mills, machinery-works, pottery, mattress, furniture, broom and trunk factories, a cereal-food plant and brick and terra-cotta works. Spokane is a substantial and admirably built city, as regards both residences and business blocks. Some of the notable buildings are the city-hall, Carnegie Library, the county court-house, St. Luke's Hospital, Masonic Temple, August Paulsen Building, Marshall-Wells Building and Columbia Building. There are more than 70 churches, and the educational facilities are of the best. The 23 brick and stone school-buildings cost over $1,500,000, and the high school $175,000. It is the seat of Gonzaga College (which cost $500,000), Academy of the Holy Name, Brunot Hall for Girls and St. John's School for Boys. Spokane has all the facilities of a thriving modern city, owns its own water-works, and has good drives and parks. The first settlement was made in 1872, the city incorporated in 1881, and, including its suburbs, has a population of 108,675.

Spon'ges, a group of animals intermediate between the protozoa (which see) and ani-

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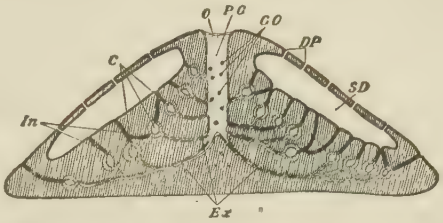
mals like the hydra and jelly-fishes (cœlenterata). The sponges were formerly regarded as plants, but that was in the days when superficial appearances only were considered. They are distinctly animals, and are usually separated into a distinct subkingdom called porifera. Although they have no distinct organs, they are clearly a step above the simplest animals. They are many-celled animals and are composed of two distinct layers. The middle layer (mesoderm) is foreshadowed in them, but is not distinctly developed. All animals above them have three distinct cell-layers. Sponges are mostly marine, but a single genus (*spongilla*) of fresh-water sponges is widely distributed, being abundant in the region about Chicago, as well as in other parts of the United States. These fresh-



Vertical section of a fresh-water sponge(*spongilla*), showing the arrangement of the canal system. C. ciliated chambers; DP. dermal pores; Ex. excurrent canals; GO. openings of the excurrent canals; PG. paragastric cavity; SD. subdermal cavities; O. osculum.

water sponges are not often noticed by the casual observer. They are clusters of soft, greenish substance looking like algæ. They will, however, shrink when touched, and, if closely watched, a current of water can be seen coming from a crater-like opening in their top. Minute points of lime are formed within their substance to serve as a support. They increase by budding and by eggs that are formed in the autumn, and carry the life over to another season. The marine sponges are varied in form, size and complexity. Their skeletons are either limy, flinty or horny. The bath-sponges and slate sponges represent the horny skeletons only. When they are living, the skeleton is covered with sponge-flesh, and they look on the outside something like a piece of liver, or like a piece of tanned kid, but always with some pores opening into them. The limy sponges and the glass-sponges are too hard for commercial use. The sponges are all permeated by branching canals which open by small pores on the surface. These canals lead into larger ones, and, finally, open into chimney-like passages which open outward by an orifice of considerable size. Water carrying oxygen and minute food-particles is continually passing in through the small surface-pores, traversing the system of canals, and passing out through the crater-like opening. Along the passage-way are rounded chambers which are lined by numerous cells provided with flagella. These cells do the feeding. The flagella are hair-like threads of protoplasm that keep waving and help to produce the currents of water. The simplest sponges are small tubes with many inlets and a single outlet. The more complex sponges have the passage-ways very much branched and usually several outlets. Sponges increase by budding and also by the formation of eggs. The sponges of the Gulf of Mexico, the

Bahama Islands and the West Indies are of a rather coarse quality. The finest sponges come from the Mediterranean and the Red Sea. Sponges of good quality are found in Florida waters, the best variety, sheeps-wool, selling for $2 to $5 per pound. Sponge-fishing has there become an important industry, employing nearly 200 small vessels, with crews numbering more than 2,500 persons. When a vessel reaches the grounds, the men go out in pairs in row-boats, one man leaning over and scanning the sea-bottom with a water-glass. When a sponge is seen, it is secured with a kind of steel fork on a long, slender pole. The flesh is removed, sometimes by imbedding in the sand, and the skeleton is left. They are then soaked in water, and afterward squeezed and dried in the air. See Hyatt's *Commercial and Other Sponges*.

Sponta'neous Combus'tion, or burning without the application of fire, sometimes occurs in mineral and other substances. Charcoal, if saturated with oil, may become so heated as to burn, and coals containing iron pyrites, when wet, will catch fire. Phosphorus, when dry, ignites easily, and has been known to melt and burn in a room where the temperature was only 70°, so that in hot weather a fire may be started by large packages of matches. Hay, cotton, tow, flax, rags, straw, leaves, if collected in large quantities, when damp undergo fermentation, which gives off sometimes enough heat to burn. The cotton-rags and waste used in wiping oiled machinery and lamps have probably started many unexplained fires. Spontaneous combustion of the human body has been thought to occur in a number of cases, usually where the individual was an habitual drinker, but is now considered doubtful. Liebig says a dead body filled with alcohol may burn of itself, but not a living one, in which the blood is circulating. See *Letters on Chemistry* by Liebig.

Spontaneous Genera'tion of Life, the doctrine that life in some form is developed from non-living matter. The ancients believed that frogs and eels sprang from mud, that insects were generated in dew, that decaying meat bred maggots, that the appearance of other forms of life was to be accounted for by spontaneous generation from lifeless matter. This belief was quite general until the 17th century, when the Italian, Francesco Redi, made experiments to test the truth of it. He placed bits of meat in open jars, and others in jars that were covered by fine gauze, and watched for the development of maggots. The blow-flies visited the uncovered meat, but were prevented from reaching the other. Of course, maggots hatched from the eggs, but did not appear in the protected meat, and, by this simple experiment, he proved that maggots did not arise spontaneously from the meat. This was about 1660. He made further experiments and reached the conclusion, not as a matter of opinion, but as a result of experiment, that life arises only from antecedent life and does not develop spontaneously.

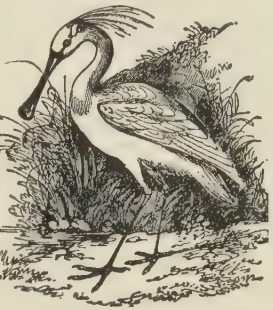
This position was quite generally accepted for larger animals, but with the introduction of the microscope, a new world of extremely minute living beings was made known, and doubts began to be entertained that those minute beings must always have parents like themselves. It is a well-known fact that fluids, like clear mutton-broth or water, in which any vegetable or animal substance has been soaked, will, if allowed to stand, soon become teeming with microscopic life. The possibility of this life arising by spontaneous generation formed a new phase of the question. Needham and Buffon attempted to put the matter to test by boiling infusions, to kill all germs that might exist in them, and corking them tightly. In course of time these fluids became cloudy and were overrun with microscopic life. But about 1775 a priest of the period named Spallanzani, showed that their experiments had not been conducted with sufficient care. He boiled infusions for three quarters of an hour in flasks, and, while the fluid was still boiling, heated the necks of the flasks and, drawing them into a fine point, he closed them by heat. No microscopic life appeared in the flask treated in this way, and the conclusion was drawn that spontaneous generation of life was disproved.

About this time oxygen was discovered and shown to be necessary to all forms of life. This brought a new point of view, and objection was made to Spallanzani's form of experiments on the score that oxygen was excluded by sealing the necks of the flasks. In order to test this objection, Schulze and Schwann in 1836 took up the question again and devised a means of admitting oxygen into the flasks containing fluids that had been boiled. The necks of the flasks were drawn out long, and convoluted, and left open at the ends. In some cases the inlet was heated and air drawn in. In other cases the air was passed through bulbs containing chemicals that did not alter the oxygen. It was soon discovered that a plug of cotton-wool in the necks of the flasks would act as a filter. It permits the air to pass through and arrests all floating particles and, therefore, does not allow dust or germs to pass through with the air. A flask, or test-tube, is partly filled with an organic infusion; the latter is boiled and, while boiling, a plug of cotton-wool is pushed into the mouth of the vessel. On cooling, the air passes through this plug, but the smallest solid particles are caught in the meshes of the cotton-wool. Organic fluids treated

in this way have been known for years to show no sign of microscopic life.

The question was regarded as settled, but in 1859 it was unexpectedly opened in Paris by Pouchet, who claimed that life was developed in organic fluids even after boiling and preventing the entrance of floating particles from the air. Pasteur, however, demonstrated that Pouchet had been careless, and had admitted solid particles to the flask in the mercury, through which the oxygen had been introduced into the flasks. This closed the question as far as it could be answered by experiment. Professor John Tyndall added something to the certainty of the matter by an ingenious experiment. He had an air-tight box made with glass-windows, through which he passed a strong beam of light in a darkened room. The floating particles in the air, contained within the box, fell of their own weight, and came to rest on the sides and bottom of the box, which had been smeared with a sticky substance to hold them. He could tell when the air was completely cleared of these particles by his beam of strong light, because any minute floating particle would become illuminated and reflect the light. When they had entirely come to rest, he called the air "optically pure." Through the bottom of this box he had inserted a number of test-tubes with their mouths opening into the chamber, and, by means of a long funnel and a hole pricked in a rubber membrane at the top, he was able to introduce a variety of organic fluids into these test-tubes. The ends of the test-tubes outside of the box were now inserted into boiling oil and all germs of life that might be contained in the fluids were completely killed. He was able to expose the fluids in these open test-tubes to the optically pure air for months, without any appearance of microscopic life in any of them. To demonstrate that the fluids were capable of supporting such life, he had simply to open for a moment an air-tight door in the back of the chamber and admit some of the outside air. When this was done, the fluids became turbid in a short time, and were teeming with microscopic life. Thus it was demonstrated that microscopic life came from floating germs in the air, and is not spontaneously generated in organic fluids. See Tyndall in *Pop. Sci. Mo* (vol. 12, 1878) and in *Floating Matter of the Air*. WILLIAM A. LOCY.

Spoon'bill, the name of birds related to the Ibises, having long, broadly expanded bills, more like paddles than spoons. They belong chiefly to the eastern hemisphere, where there are six or seven species. The European spoonbill is a white bird about 32 inches long. It breeds in Holland and other parts of Europe. The roseate spoonbill is the only American species. It is abundant in the tropics and also breeds in the southern United States. These birds inhabit marshes, muddy borders of estuaries and small sea-islands overgrown with bushes. They are from 28 to 35 inches in length, of a beautiful rose-color, deepest on the wings, fading to almost white on the neck, back and breast. Their tail-coverts are deep carmine. They feed at night by gathering insects and shell-fishes from the mud in shallow water. In the breeding season they congregate in large numbers.



WHITE SPOONBILL

Sporangium (*spō-răn'jĭ-ŭm*), an organ of plants which produces asexual spores. In the thallophytes a sporangium is usually a single cell; but in the higher plants it is a many-celled organ. The sporangia of ferns and the pollen-sacs of seed-plants are illustrations of many-celled sporangia. In heterosporous plants sporangia become differentiated, the microsporangia producing microspores, and the megasporangia producing megaspores. In seed-plants the pollen-sacs are microsporangia, and the ovules are megasporangia.

SPORANGIUM OF A MOULD

Spore, a plant-cell specially set apart for reproduction. Spores have received the greatest variety of names in different groups of plants, but they may all be reduced to two great groups. Asexual spores are those which are formed by the division of a cell, or at least are not formed by the union of cells; while sexual spores are those which are formed by the union of two sexual cells, called gametes. These two types of spores do not differ from one another in power, but in mode of origin. The sexual spore has received the general name of oöspore; but in plants in which the pairing gametes are similar it is more frequently called a zygospore or zygote. The asexual spores have received very many names. Among the green algæ the characteristic asexual spore is a ciliated, free-swimming cell, and is called a zoöspore or swarm-spore. Among fungi, asexual spores have received such names as conidia, ascospores, uredospores, teleutospores, æcidiospores, basidiospores etc. Among bryophytes and pteridophytes they are known simply as spores. When heterospory is introduced, they become microspores and megaspores; and in spermatophytes they are known as pollen-grains and embryo-sacs. Such a

multiplicity of names for the same body is very confusing at first, but when the terms are learned they are very convenient in designating either the group or method of origin of the spore referred to.

Sporogonium (*spō-rō-gō'nĭ-ŭm*) (in plants), the leafless sporophyte of mosses, as distinguished from the leafy sporophyte of ferns and seed-plants. When highly organized, it consists of foot, seta and capsule; and its sole function is the production of spores. See MUSCI.

Sporophore (*spō'rō-fōr*) (in plants), a special branch which bears spores. Used chiefly among the fungi, where special spore-bearing branches arise from the mycelium. See FUNGI.

Sporophyte (*spō'rō-fīt*). In alternation of generations (which see) among plants the generation which bears the asexual spores is the sporophyte, as distinguished from the generation which bears the sex-organs and produces the sexual spore, called the gametophyte. In the mosses the sporophyte is the leafless sporogonium (which see), consisting chiefly of a spore-case (capsule) on a stalk. In the ferns and seed-plants the sporophyte becomes the conspicuous leafy part of the plant, in fact the whole plant of ordinary observation. It is of interest to note that the sporophyte is essentially sexless, and that to speak of "flowers," structures produced by the sporophyte, as having sex-organs, is very far from the fact.

Spottsylva'nia Court House, a small village in Virginia, 55 miles northwest of Richmond. It is known as the scene of one of the desperate battles of the Civil War, fought between Lee and Grant, May 10, 1864. When Grant was driven back, with terrible slaughter, he wrote to the secretary of war the famous message: "I propose to fight it out on this line, if it takes all summer." On the 12th the attack was renewed, and the next day Lee, suffering from heavy losses, withdrew to an inner line of intrenchments, from which Grant could not drive him but moved around him on his way to Richmond.

Spray'ing-Mixtures are intended to be applied in liquid form by means of spraying-machines to trees, small fruits, vines, flowers and vegetables to prevent the ravages of fungous diseases of insects. Fungicides and insecticides may, in many cases, be applied dry as well as in solution, as the Bordeaux mixture, Paris green etc. Fungicides much used are the popular Bordeaux mixture (*q. v.*) and ammoniacal solution of copper-carbonate. The latter contains copper-carbonate, five ounces, made into a paste by adding one and a half pints of water, aqua ammonia of 26 degrees strength and 45 gallons of water. This preparation is clear, and is not so easily noticeable on the plants as are the preparations containing lime. Insecticides for spraying are of two sorts, depending upon the general division of injurious insects into the classes of biting-insects and sucking-insects. Biting-insects, those with jaws for chewing foliage, fruit etc., will also eat the poison on their food; hence the arsenical poisons are most generally used for this class of insects, examples of which are grasshoppers, potato-beetles and other beetles. Sucking-insects have bills that penetrate the plant-tissues, as of the stem, and so are not affected by poisons on the surface. Examples are plant-lice, scale-insects and squash-bugs. They mostly have soft bodies and are fought with soap-kerosene emulsions, designed to coat their bodies and suffocate the insects by excluding the air from the breathing-pores scattered over their skin; for these animals do not breathe through an opening in the head. The lime-sulphur wash is widely used for scale-insects in orchards. The larva or caterpillar stage of flies, beetles, moths and butterflies have both soft bodies and jaws for chewing, and so can be fought by either kind of antidote. The best known of the first class of insecticides are Paris green, London purple and white hellebore. Paris green is composed of copper oxide, acetic acid and white arsenic (arsenious oxide), and should contain at least 50% of the last-named ingredient. Paris green should be mixed with quick-lime to render insoluble any free arsenic, which is poisonous to plants, at the rate of one pound of each to each 100 or 300 gallons of water. The mixture should be strained, and constantly stirred while using. London purple is less reliable, on account of the larger amount of soluble arsenic and the variability of its composition. The lime-sulphur wash is composed of unslaked lime 20 pounds, flowers of sulphur 15 pounds and water to make up from 45 to 50 gallons.

The concentrated stock-solution of kerosene-emulsion is composed of hard soap in fine shavings or even of soft soap one half pound, rain-water one gallon, kerosene (sometimes called coal-oil) two gallons. The soap-solution is brought to a boil, poured into the kerosene, and churned vigorously. Dilute for use with 10 to 20 volumes of water. A diluted decoction of tobacco-stems is good for spraying house-plants and garden-vegetables. While not exactly a spraying solution, carbon bisulphid is much used for pests living around the roots of garden-truck. It is a highly inflammable liquid with a very disagreeable odor, and, when poured down a small hole near the base of the plant, it drives away cut-worms and similar pests. Consult Lodeman's *Spraying of Plants*, Weed's *Insects and Insecticides*; and bulletins of the state experiment-stations and of the U. S. Dept. of Agriculture.

Spring'bok, a species of antelope found most abundantly in Africa. It is a beautiful creature, larger than the roebuck, brown above and white underneath. The head is white, except a broad band of brown on each side of the eye to the mouth and a brown spot in the middle of the face. Its name comes from the great leaps it makes, springing into the air from seven to 12 feet. It lives on sandy plains, but great herds will travel to more fertile regions. A traveler describes a vast herd seen by him, pouring through an opening in the hills, a living mass half a mile in breadth and taking hours for the passage. It is growing scarce, though still abundant near Zambezi River.

Spring'field, Ills., the capital, is in Sangamon County, a short distance southwest of the center of the state; and, according to the latest census, had a population of 46,528. The first settlement was in 1818, and in 1821 the town was made the county-seat. In 1837 the capital was removed to this place, and a state-house erected. The present capitol, begun in 1868, first occupied in an unfinished condition in 1876 and completed in 1885, cost $5,000,000. The surrounding country is a rich agricultural region, the chief products being corn, oats, wheat, hay, fruits and vegetables. Cattle, hogs and horses are raised extensively. Bituminous coal is mined in large quantities around the city, and is one of the leading products. During the year ending July 1, 1900, 2,519,511 tons of coal were mined in the county, and four fifths of this amount shipped by rail to other parts of the country. The principal articles manufactured here are iron, steel, steam-engines, boilers, agricultural implements, brick, watches and woolen goods. It is a railroad center, main lines of the Wabash; Alton; Illinois Central; Baltimore and Ohio Southwestern; and other roads passing through it, besides a number of interurban electric lines.

The city has a very efficient public-school system. There are 15 buildings, one for high-school purposes with a capacity for 800 pupils, and 14 other buildings for primary and grammar schools. The school enrollment has reached 7,500. Besides, there are colleges and many private schools. Springfield is of historical interest on account of having been the home of Abraham Lincoln. The house in which he resided, when elected president, still stands; and in beautiful Oak Ridge Cemetery just outside the city, is a fine monument erected to his memory, where his remains are deposited. The state-fair grounds and buildings, the most extensive in the country, the encampment-grounds and the armory are here.

Springfield, Mass., a city on Connecticut River, 25 miles north of Hartfort. It is a well-built city, parts of it elevated, with a fine park. It is noted for its excellent public school system and fine churches, including a cathedral. The United States armory, employing 3,000 men during the Civil War and from 500 to 700 ordinarily, and the arsenal, in which 500,000 stand of arms can be stored, are located here. The manufactures of the city are numerous and important, including the Smith and Wesson arms-factory, the great car-factory at Brightwood, a suburb, the Knox Automobile Company and others, making gold chains, goldleaf, filters, envelopes, hardware, spectacles, thimbles, needles, buttons etc. Springfield was settled in 1635 by emigrants from Roxbury and called Agawam, from the Indian name of a neighboring river. The city was burnt in 1675 during King Philip's war. It is served by six railroads, including branches, and splendid civic spirit prevails. Population 76,000.

Springfield, Mo., a city in southwestern Missouri. It is built on a table-land 1,500 feet higher than St. Louis, and has an important trade. There are flouring-mills and wagon-factories. Drury College was founded here in 1873. Springfield was a trading-post in 1820, and incorporated in 1830; it has two great railroad-plants, one for the Kansas City and Memphis, and one for the St. Louis and San Francisco system. During the Civil War it was held by Federal and by Confederate forces in succession, and the battle of Wilson's Creek was fought near the city, Aug. 10, 1861. Population 35,000.

Springfield, O., a city in the western part of the state, on Mad River, 80 miles northeast of Cincinnati. It is in a fine farming region, and has a large trade in farm-products. With good water-power, manufactories are numerous, especially those of bicycles, piano-plates, iron fencing, steam-engines, road-rollers and farm machinery, including large numbers of mowers and reapers Wittenberg College, opened in 1845 by the Lutheran church, and Springfield Seminary are institutions of higher learning. Located in this city are the state fraternal homes of three orders: Masons, Odd Fellows and Knights of Pythias. Population 38,253.

Springs are the outflow of underground streams. In general they are due to the accumulation of water which has sunk into the ground, until its course has been closed by a layer of impervious rock. In such cases the water must find some outlet. Such an outlet may often occur in a valley or upon a hillside It occurs in a valley wherever such a valley dips into the ground-water; and on a hillside wherever the percolating water runs along the slope of a bed of rock or clay to the outcrop of the bed. Springs frequently become charged with minerals which have been dissolved in the course of the percolation of the water. The water of hot springs and geysers generally rises from a great depth, whither it has penetrated through a cleft in the start to the warmer

zone below. Artesian wells merely are deepened, artificially assisted springs. Springs that rise from a great depth are generally permanent; but many springs are intermittent; others quite variable. The largest springs may indicate the exit of considerable subterranean rivers.

Spur'geon, Charles Haddon, a celebrated English preacher, was born in Essex, June 19, 1834. He never received a collegiate education, beginning his great work by making religious addresses. In 1850, while living at Cambridge, he entered the Baptist church, preaching his first sermon in a cottage four miles from Cambridge. When only 18 he had charge of a Baptist church at Waterbeach, and the small congregation soon doubled. He went to London in 1854, his church there being twice enlarged to accommodate the crowds that flocked to his preaching, until, in 1861, the great Tabernacle, seating 6,000, was built. At one service in Crystal Palace he preached to 24,000 people. His sermons were issued in weekly numbers and translated into many languages. Besides preaching, he conducted a training-school for ministers, an orphanage and an almshouse, and built 36 churches in London. His publications reached nearly 100 volumes, including several volumes of sermons. He preached without writing his sermons, which were taken down in shorthand as they were delivered, and carefully revised by himself. The weekly circulation averaged 30,000, but that of particular sermons was much larger. He died at Mentone, France, Jan. 31, 1892. See *Life* by Spindler, Dyer etc.

Spy, one employed in war to collect information of the enemy. Spies are always used in regular warfare, and no disgrace attaches to the officers employing them. The dishonor which seems to belong to the person acting as a spy comes probably from the fact that the greater number of spies have been traitors to their country, offering their services freely to the enemy. When a soldier volunteers to penetrate the enemy's lines in disguise, to help his own country and army, it is a brave and honorable act and is so recognized, though the laws of war mete out the same ignominious death to all classes of spies. Major André and Nathan Hale, though hanged, are honored for their devotion and self-sacrifice. The risks of the undertaking have made it attractive to those loving adventure, and many thrilling stories are based upon them, notably Cooper's *Spy*. Political spies are those employed by governments to detect conspiracies. They were used in England in the days of the Tudors and, lately, in Ireland. Bismarck was believed to employ them to a large extent, and Napoleon III had a regularly organized system. Russia has the most perfect arrangements for using spies, both at home and abroad, of any modern nation. See *Secret Service under Pitt* by Fitzpatrick and *The Two Spies* by Lossing.

Squid, an elongated cuttlefish extensively used as a bait by cod-fishers. They are found in nearly all seas and are very abundant on the New England coast. They swim in large schools, following young mackerel and herring, upon which they feed. They in turn are eaten by larger fishes. The common squid ranges in size from six to 18 inches, or even longer. They swim backward by throwing jets of water through the siphon. They have ten long arms provided with suckers, being in this regard similar to other members of the group (cephalopoda). Giant squids, of a different genus, have been taken, measuring 52 feet long, counting the arms. One is reported whose body alone measured 23 feet. See CUTTLEFISH.

Squier (*skwīr*), **Ephraim George,** an American antiquarian author, was born at Bethlehem, N. Y., June 17, 1821. He was for several years an editor, but, becoming interested in the antiquities of the Scioto valley in Ohio, began to make a study of such remains, traveling through the Mississippi valley and New York. He published the results of his work in 1848 in the *Smithsonian Contributions to Knowledge*. While *chargé d'affaires* in Guatemala, he made further explorations there, receiving a gold medal from the French Geographical Society for his work. He continued his researches while surveying a railroad-route in Honduras in 1853 and while United States commissioner to Peru in 1863. Among his works are *Nicaragua: Its People, Scenery and Ancient Monuments; Notes on Central America;* and *Peru: Explorations in the Land of the Incas*. He died at Brooklyn, N. Y., April 17, 1888.

Squir'rel, the name for any one of a group of small rodents or gnawing animals. They

SQUIRREL

are found in all parts of the world, except Australia. They are abundant in North

America, but are poorly represented in South America and in Europe. There are two natural divisions of the squirrel family, the ground-squirrels and the tree-squirrels. The latter are graceful, agile animals, with slender bodies and very long, bushy tails. They feed mainly on acorns and nuts, but occasionally eat animal food and birds' eggs. They sit upon their haunches and handle nuts adroitly with their fore feet. They cut through the shell with their sharp teeth. The red squirrel, which represents the common squirrel of Europe, is the smallest and prettiest of our tree-squirrels. It is about eight inches long, and ranges southward from the northern limit of trees. The gray squirrel is one of the best-known species. It reaches a length of about ten inches, and is common east of the Rocky Mountains from Canada to the Gulf of Mexico. It is subject to great color variations, being sometimes black. This tendency for one species to vary in color is common to all tree-squirrels. Other gray squirrels are found in the western parts of the United States. The fox-squirrel is the species found east of the Great Plains. It reaches a length of 12 inches, and has a large tail of about the same length. The tree-squirrels have nests provided with food, in hollow trees, in which they pass the severest weather of winter. The ground-squirrels make burrows, which they also supply with food. North America is the richest of all countries in ground-squirrels. The group includes such forms as woodchucks, prairie-dogs, gophers and chipmunks. The latter, called also striped squirrels, are the best known. They stand on the dividing line between the burrowing forms and the tree-squirrels. All have cheek-pouches, in which their stores are carried to their nests. Tree-squirrels are good eating, and the fur of those inhabiting Siberia and Russia is of commercial value.

Sta'bat Ma'ter ("the mother was standing") is a celebrated Latin hymn on the seven sorrows of the Virgin Mary. It has been set to music by many composers, among them Haydn and Rossini. It dates back to the 13th century, and is thought to have been written by Jacopone, a Franciscan monk. It is used by the Roman Catholic church in its services in passion-week.

Sta'dium, originally the Greek measure of length or distance when undertaking a journey; also used by the Romans as a linear measurement. As used at the foot-race course (*stadium*) at Olympia, it indicated one eighth of the Roman mile or a little over 600 English feet. The term has come to be applied to the structures erected on race-courses and athletic fields, from which spectators witness games or contests. The stadium recently restored at Athens and the stadium of Harvard College in the United States are examples.

Stäel (*stä'ĕl*), **Madame de,** a celebrated Frenchwoman, was born at Paris, April 22, 1766. Her maiden name was Anne Louise Germaine Necker, as she was the daughter of Necker (*q. v.*), the French statesman. She wrote romances in her girlhood and a volume of *Letters to Rousseau.* She was married in 1786 to the Baron de Stael-Holstein, the Swedish ambassador at Paris, from whom she separated in 1798, though only to save her fortune from his debts, hastening to his bedside when he died. This marriage made her the center of the brilliant society of Paris, for which she was fitted by her wonderful powers of conversation and her strong enthusiasm and passion. She believed in the Revolution, but hated its horrors, making a vain effort to save the life of the queen and saving Montmorenci and other friends from the guillotine at the risk of her own life. She left Paris in 1792, spending four months in London; "four months of happiness saved from the shipwreck of a life" she called them. In 1797 she returned to Paris, where her great influence made Joseph Bonaparte anxious to win her to his brother's cause by offering to secure for her $4,000,000, which was owing to her father from the treasury. She refused the gift, afterwards accepting it from Louis XVIII. Napoleon hated her; and, finding her *salon* the center of the disaffected party and himself the butt of the brilliant wit of her circle, he banished her from Paris. She went to Weimar, adding to her intimate circle Schiller, Goethe and Schlegel. Her book on *The Influence of the Passions* was published in 1796, and the famous one on *Literature Considered in Its Relations to Social Institutions* in 1800; and after her father's death she wrote his life. Her first romance was *Delphine,* her own story, followed by the well-known *Corinne,* written in 1805, after a sojourn in Italy, which made her name known throughout Europe and revealed Italy to France. Her *Germany* was finished in 1810 and approved by the censorship, but when 10,000 copies had been printed, the whole edition was seized and destroyed by Napoleon's order on the plea that "it was not French." The manuscript had been saved, and the book was published in London in 1813. Her exile now became imprisonment, as she was surrounded with spies, her friends exiled for visiting her, and her walks restricted to a circle of two miles around her home. She escaped to Russia and finally to London, welcomed in the principal cities, not only because of her genius, but as the enemy of Napoleon Under Louis XVIII her old position in Paris was resumed until ended by the return of Napoleon from Elba. In 1811 she had secretly married a French officer, much younger than herself, a marriage acknowledged in her will and made public after her death by her children. She died

at Paris, July 14, 1817, leaving unfinished her *Considerations upon the French Revolution*, published by her children and thought by Sainte-Beuve to be her finest work. See *Life* by Stevens and *Life and Times* by Norris.

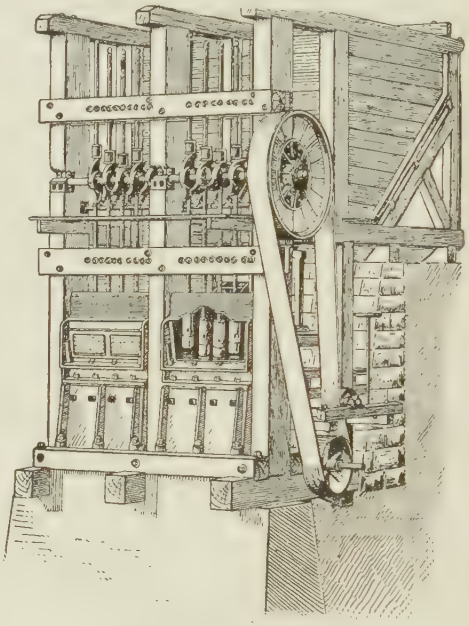
Stag, the male of the red deer which is found all over Europe and in a large part of Asia. It is a noble animal, about seven feet long, and four feet high at the shoulders, with large, branching antlers. It has been driven from inhabited districts, and is now found only in deep forests. In Scotland it is hunted by a form of stalking, but in England on horseback. See DEER, ELK and REINDEER.

Sta'mens, in an ordinary flower the outer of the two sets of sporophylls or sporangial leaves, the carpels being the inner set. Stamens are microsporophylls, and the spores they produce are microspores (pollen-grains). See FLOWER.

Stam'ford, Conn., a town 33 miles northeast of New York, on Long Island Sound. It is a suburb of New York City and a summer-resort for the business men of the city, whose handsome homes are on all the surrounding hills. There are iron and bronze foundries, manufactories of hats, drugs, sashes, blinds and locks. The town was settled in 1641. Population 17,332.

Stamp-Act, a measure for raising revenue by requiring the use of government stamps on all legal documents used in the British colonies in America. It was passed in 1765, and was resisted by the colonies because they denied the right of the English Parliament to tax them without representation; that is, without their having a voice by their delegates in the matter. Riots took place in many towns, and the stamped paper was seized and destroyed. A congress of nine states met and claimed the right of taxation for their own assemblies. The stamp-act was repealed by Parliament in February, 1766, after a great debate in which Burke made his first speech, and Pitt took the side of the colonists in one of his greatest speeches.

Stamp-Mill. A stamp-mill is a mill in which ore is pounded into particles so fine that the metal it contains is separated from the ore-stuff. Stamp-mills are commonly used for crushing gold or silver-bearing quartz. The stamps are stems of wrought iron two to three inches in diameter and ten to 15 feet long. At the bottom of the stem is a head eight to 12 inches in diameter and 15 to 20 inches long, into which is set a movable steel or cast-iron shoe, the diameter of which is the same as the head and the length somewhat less. When equipped, the stamp ordinarily weighs from 400 to 1,000 lbs. The ore is caught and crushed between the falling stamp and a die of the same material and diameter as the shoe. Ordinarily the ore is fed into a mortar-box containing five dies set on a level and in line. The box is enclosed, except for openings for the stems, the ore and water. Across the lower part of one side is stretched a screen of wire-mesh or perforated plate. The size of the openings in the screen is determined by the fineness of crushing required in order to separate the metal from



TEN-STAMP BATTERY

the ore-stuff. The five stamps that pound in the same battery are dropped in succession, and so the ore and water are driven from side to side. Particles crushed sufficiently small are washed through the screen.

Before the ore is fed into the mortar-box it must be broken into fragments from one to three inches in diameter. This is usually done by a machine called a rock-breaker, which rubs and presses the rocks between two hard, corrugated surfaces. In the modern stamp-mill the ore is dumped into great bins and then handled entirely by machinery.

The gold or silver that is free from chemical combination is caught on plates over which the stream of sand and water flows after leaving the battery. These plates are usually made of soft copper, which is rubbed with quicksilver until its surface forms an amalgam. This catches or amalgamates the gold or silver that comes in contact with it. The amalgam can then be scraped off and the gold or silver separated from the quicksilver. Sometimes gold is so fine that it floats on the surface of the water and does not touch the plate. Much of this floating gold can be caught on blankets over which the stream is made to flow. Still more important are the processes by which the chemical combinations containing gold or

silver, especially pyrites, are caught and saved. As pyrites is heavier than the ore-stuff, it can be separated by a process of shaking and settling. The machine by which this is done is called a concentrator or vanner, and most stamp-mills find it profitable to be well-equipped with these. Consult Huntington and McMillan's *Metals: their Properties and Treatment.*

Stamps are issued by governments for use on documents, merchandise, letters etc. Stamp-duties were first imposed in England in 1694. It is a form of indirect taxation, the stamps being bought of the government, the use of them required by law, and any forgery of them punished. During the Civil War in the United States many articles paid stamp-duty, the last of such taxes being repealed in 1883. In 1898 similar duties were imposed to help meet the cost of the Spanish-American war; but Congress in 1901 removed most of these taxes. Stamps for the payment of letters were first generally used in England in 1840, at the suggestion of Sir Rowland Hill, and in the United States in 1847. The first English postage-stamp was black, with a portrait of Queen Victoria, and since then about 1,600 different stamps have been in use in England and her colonies. The first United States stamp had the portrait of Franklin and was worth five cents. There have been a great variety used since, as many as 127 different kinds being in use at one time. Some countries have used the national arms on stamps, and some simply a number with an inscription. Stamp-collecting became fashionable about 1864 and has developed into a science called philately, with periodicals and associations devoted to the pursuit. Rare stamps command large prices, an English one of 1847 with the postal mark bringing about $375.

Stand'ard Oil Company, a company or group of companies presided over by Mr. John D. Rockefeller, which has almost a monopoly of the oil-industry in many states of the American Union. This company has by its enterprise, especially in the use of pipe-lines to conduct the oil from its sources to the principal markets, driven most of its competitors from the field. It not only supplies the markets of the United States, but exports great quantities of oil abroad Many charges have been urged against its business methods in ousting competitors, as also concerning its alleged political influence. In 1907 the company was prosecuted and convicted of accepting illegal rebates from certain railroads. The enormous fine of upwards of $29,000,000 was imposed by Judge Landis; but this action was set aside on appeal. For refining petroleum see REFINING.

Standards are weights and measures defined by proper authorities. National standards are defined and preserved by the respective governments of those who use them. There practically are only two groups of standards in use, the *British* and the *metric* group.

The British system is founded upon the standard yard, the standard pound and the standard gallon. The metric system is based upon the standard meter, the standard kilogram and the standard liter. See KILOGRAM, METRIC SYSTEM, POUND and YARD.

Besides these, the requirements of commerce and of modern science have made necessary standard thermometers, standards of electrical resistance, standards of light etc. Thus the mercury thermometer, which has been compared directly with the nitrogen gas thermometer at the international bureau of weights and measures at Sèvres, is practically a standard thermometer. The Hefner lamp, as tested by the Reichsanstalt at Charlottenburg, Prussia, practically is a standard for sources of light. But these standards, like the ohm, which is the standard of resistance, and the Clark cell, which is the standard of electromotive force, are defined in so definite a manner that they can be copied or made by any one who is equipped to follow the legal prescriptions; and hence they are represented by material or arbitrary standards, as in the case of the meter. See MEASUREMENT.

Stan'dish, Miles, one of the *Mayflower* company, was born in Lancashire, England, about 1584. He served in the army in the Netherlands and sailed with the Pilgrims in the *Mayflower* in 1620, though not a member of the Leyden congregation. On reaching Massachusetts he was chosen captain by the Pilgrims, and commanded in expeditions against the savages. He settled finally at Duxbury, Mass., where he died on Oct. 3, 1656. A monument, 100 feet high, crowned by a statue, has been built to his memory at Duxbury. The story of his unsuccessful effort to secure a wife is told by Longfellow in his *Courtship of Miles Standish,* which, however, is not free from anachronisms and inaccuracies. Consult *Life* by Abbot and *Footprints of Miles Standish* by De Costa.

Stan'ford, Leland, American public man and philanthropist, was born at Watervliet, N. Y., March 9, 1824, and died at Palo Alto, Cal., June 20, 1893. Early in life he studied law and was admitted to the New York bar; but in 1849, attracted by the gold-discoveries in California, he proceeded there and engaged in gold-mining and in business in San Francisco. He was one of the organizers of the Central Pacific Railroad Company, and entering political life was made Republican governor of California (1861–3). From 1885 to 1893 he was United States senator. Out of his

large money amassings he gave property to the value of $20,000,000 to found, in memory of a deceased son, a university at Palo Alto, to be known as the Leland Stanford Junior University — a princely and most useful benefaction. See PALO ALTO.

Stan'hope, Lady **Hester Lucy,** was born at London, England, March 12, 1776. For three years she lived with her uncle, William Pitt, as the manager of his household and his most trusted confidant, and at his death was given a pension by the king. In 1810 she began the life that made her famous, wandering on the eastern shores of the Mediterranean and settling in 1814 among the half-savage tribes of Mount Lebanon. She adopted the customs, costume and religion of the Mohammedans, and obtained great influence over the people, who looked upon her as a prophetess. The old convent where she lived was fortified and garrisoned by Albanians and became a refuge for all who needed help. She is said to have sheltered several hundred refugees after the siege of Acre. Her last years were spent in poverty, and she died near Mount Lebanon, with only natives around her, June 23, 1839. See *Memoirs*, published by Dr. Meryon.

Stanhope, Philip Henry, Earl, an English historian, was born at Kent, England, Jan. 31, 1805. He studied at Oxford and entered the house of commons, where he helped to secure the passing of the Copyright Act in 1842. His historical works, which rank very high, are *War of the Succession in Spain; History of England from the Peace of Utrecht to the Peace of Versailles;* and *History of Spain under Charles II.* He also wrote lives of Belisarius, Condé and Pitt, and edited *Chesterfield's Letters.* He is also known by his courtesy title of Lord Mahon. He died at Bournemouth, England, Dec. 22, 1875.

Stan'ley, Arthur Penrhyn, dean of Westminster, was born at Alderley, Cheshire, England, Dec. 13, 1815. He was educated at Rugby, under Dr. Arnold, and at Oxford. At Rugby he was mentioned as the delicate boy in *Tom Brown's Schooldays,* who, trembling with fear, still knelt to say his prayers in spite of the jeers and rough usage of his companions. At Oxford he took the Ireland scholarship, the Newdigate prize for a poem and a first-class degree; was made a Fellow of University College; and after traveling in the east became a tutor in the college. In 1851 he became canon of Canterbury; in 1856 professor of ecclesiastical history and canon of Christ Church; and in 1863 dean of Westminster. As a preacher at Westminster Abbey he had a wide influence, and a great multitude thronged the church whenever it was known that he was to preach. As a leader of the Broad-Church party, he invited clergymen of the Scottish church and of the Free-Churchmen of England to address his evening congregations. In 1852–3 he traveled in Egypt and Palestine, gaining material for his work on *Sinai and Palestine* (1856), and in Russia in 1857, embodying the results of the journey in his pictures of the life and history of Russia found in his *Eastern Church.* He was the author of *Thomas Arnold, Memorials of Canterbury, Memorials of Westminster Abbey* and of lectures and addresses. He died at Westminster, July 18, 1881, and was buried by his wife in Henry VII's Chapel. See *Life* by Oliver and Bradley's *Recollections.*

Stanley, Henry Morton, the African explorer, was born near Denbigh, Wales, Jan. 28, 1841. His name was John Rowlands, and at 14 he worked his way as a cabin-boy to New Orleans, where he obtained employment in the office of a merchant named Stanley, whose name he afterwards took. After the death of the merchant he entered the Confederate army, was taken prisoner, and later served in the United States navy. In 1867 he was a correspondent for the New York *Tribune* in an Indian expedition, and in the same year entered the service of the New York *Herald.* In 1867 he accompanied Lord Napier's expedition to Abyssinia as special correspondent for the *Herald,* and such were his enterprise and skill that the news of the fall of Magdala first reached the British government through the New York *Herald.* While in Spain, still acting as a newspaper-correspondent, he was called to Paris, where he received the order from the editor of the *Herald* to "find Livingstone." Traveling by way of Egypt, Palestine, Turkey, Persia and India, in January of 1871 he reached Zanzibar, and in March set out on his first journey into the heart of the dark continent. Two white men who started with him turned back, but Stanley pressed on with his band of natives, showing the courage and perseverance which have given him so high a place in the long roll of African explorers. He found Livingstone on Nov. 10 at Ujiji on Lake Tanganyika, and stayed with him four months, exploring the northern end of the lake and proving that it has no connection with the Nile. He reached England in August, 1872, where he was received with enthusiasm by the whole nation. *How I Found Livingstone,* published in the following November, had an enormous sale. As correspondent for the *Herald* he was in the Ashanti cam-

HENRY M. STANLEY

paign, reaching England in time to be present at the funeral of Livingstone in Westminster Abbey.

The death of Livingstone aroused a great desire in Stanley to complete his work. The New York *Herald* and the London *Daily Telegraph* fitted out an expedition, giving him the command, and he left England in August, 1874, for his second African journey. With 350 men he started in November into the interior. He was ten months in crossing from the eastern to the western coast, arriving at the mouth of the Kongo a white-haired man, the only survivor of his white companions, and with scarcely a third of his native troops. *Through the Dark Continent*, the story of this journey, is more exciting than any romance. The direct results were the determining of the boundaries of Lakes Victoria and Tanganyika and the tracing of the Kongo from the heart of Africa to the Atlantic, thus changing materially the map of Africa. The opening of the Uganda region to missionaries, the forming of the Kongo Free State and the general scramble for Africa among European nations followed. Stanley acted from 1879 to 1884 under the king of Belgium in organizing the Kongo Free State, returning afterwards to the United States, where he delivered lectures on his African work. In 1889 he was sent in command of an expedition for the relief of Emin Pasha. He left the mouth of the Kongo on June 15, divided his forces at Yambuya, 1,300 miles from the sea, was for months hid from the civilized world, but, through disaster and loss of friends and followers, pressed on until he found Emin on the shores of Lake Albert. On this journey he discovered a great forest in the northern part of the Kongo basin and the huge snow-capped summit of Ruwenzori, 18,000 feet high. Other of his works are *In Darkest Africa, My Dark Companions, Slavery and the Slave-Trade; The Kongo and the Founding of its Free State; Coomassie and Magdala;* and *Through South Africa.* In 1899 he was knighted. He died on May 9, 1904. See *Life* by G. Mercer Adam.

Stan'ton, Edwin McMasters, an American statesman, was born at Steubenville, O., Dec. 19, 1814. He graduated at Kenyon College, and practiced law at Steubenville, at Pittsburg and finally at Washington. In 1860 he was made attorney-general of the United States, and in 1862 secretary of war. This important position he held during the Civil War, and many decisive movements of the army were made at his suggestion. Difficulties with President Johnson led to his resignation in 1868, Congress passing a vote of thanks for his ability and faithfulness. He was nominated judge of the supreme court by Grant, but died on Dec. 24, 1869, before his commission was made out.

Stanton, Eliz'abeth Ca'dy, an American reformer, was born at Johnstown, N. Y., in 1815. Her attention was first drawn to the wrongs of women in her father's law-office, where she heard their bitter complaints of the injustice of the laws. When fitted for college, having won the first prize in Greek, she could find no college that would admit a woman, and when attending the world's antislavery convention in London in 1840 with her husband who was a delegate, all the women-delegates were refused admission. One of these was Lucretia Mott, with whom she joined in the work of reform, the first woman's rights convention being held at her home in Seneca Falls, N. Y., July, 1848. From this time she continued to be one of the most prominent workers in the cause, addressing conventions, and political and legislative bodies. She died on Oct. 25, 1902.

Star-Cham'ber, a court which met in the council-chamber of the palace of Westminster. The roof of the room was decorated with gilt stars, which are supposed to have given the court its name It was founded or restored in 1487 by Henry VII to assist in bringing to justice the great landowners and nobles. It was independent of a jury, who were too often afraid of the nobility, and could inflict any punishment but death. The trial was conducted by written questions, unless the accused chose to confess. This confession became such an abuse, torture being used to extort it, that in 1641 the court was abolished.

Star of Beth'lehem, a class of plants belonging to the lily family, somewhat like the hyacinth. It is a native of the eastern hemisphere. The common variety comes from France and Switzerland, and is found everywhere in gardens, with its clusters of white flowers and narrow, green leaves growing from bulbs.

Starch, a vegetable substance found in most plants, particularly in the seeds, bulbs, tubers etc. For commercial purposes starch is obtained from numerous plants, chief among which are wheat, corn, rice and potatoes. It has the same elements as sugar — carbon, hydrogen and oxygen — but in different proportions. It is made of small round grains or granules, which differ in shape in each species of plant. As usually prepared, it either is a white powder or irregular white columns, which come from the breaking up of a dried cake of the material. It does not dissolve perfectly in cold water, but with hot water the granules burst, forming a clear paste, which is the starch used in the laundry. When heated to about 320°, it is changed into dextrine, the gum used on postage-stamps. Starch is found especially in cereals, potatoes, carrots, parsnips, sago, tapioca and rice. Potatoes are about one fifth starch; rye, oats, wheat and corn

nearly two thirds; and rice about nine tenths. Starch is made from corn by soaking it 48 hours in water, then grinding it and straining through sieves, after which the starch is allowed to settle in vats, when it is washed, bleached and dried. Potato-starch is made by grating potatoes, adding water and straining, settling, washing and drying. Wheat-starch and rice-starch are made by slightly different processes, to remove the gluten they contain. Arrow-root, tapioca, sago and cornstarch are forms of starch used as food. Starch is also used in the manufacture of calico and other cloths, in mounting photographs and in the laundry. It is also used in the manufacture of glucose, (*q. v.*). Cornstarch was first made in the United States in 1842. The factories at Oswego, N. Y., and Glen Cove on Long Island are the largest starch-factories in the world. There are about 100 starch-factories in the United States, making corn, wheat and potato starch, of which 10,000,000 pounds are exported yearly.

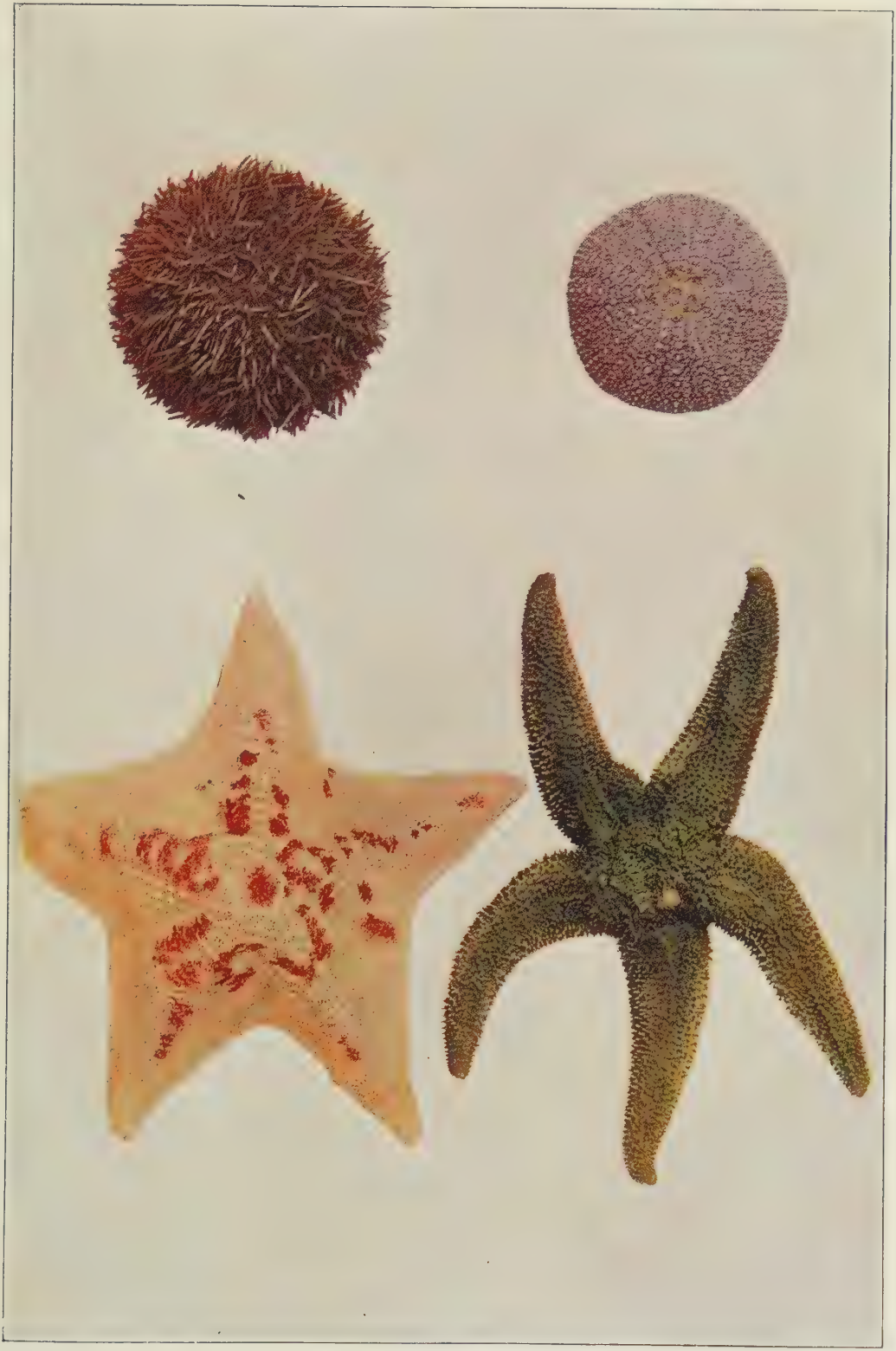
Star'fish, the name for a number of marine animals having arms or rays arranged around a central disk. As these

STARFISH

are symmetrically arranged, the animal is said to have radial symmetry. There are several varieties, but the common five-rayed starfish is the type. It is reddish, or yellow, in color, and those along the New England coast commonly vary from one inch to one foot in diameter. It lives on the sea bottom and crawls sluggishly by means of tube feet. It is often seen in shallow pools left by the retreating tide. The skin is stiffened with plates and nodules of lime. The mouth is in the center of the disk, on the under side, and the animals feed on decaying fish and other animal matter, as well as on small shelled mollusks. Their means of locomotion is peculiar. There are four rows of tube-feet in furrows along the lower sides of the arms. These tube-feet are filled with water and connected with a system of water tubes running through the body. On the back of every starfish may be seen a little rounded knob, which is porous and leads into the water-vascular system. From this tubercle, a tube leads downward to join a circular canal surrounding the mouth, and from this central canal a tube extends into each arm or ray. These latter canals are connected with the tube-feet and also with internal pockets, one for each tube-foot. The nervous system consists of a ring about the mouth and a nerve running from it into each arm. At the extremity of each arm is found a little red eye-spot which is sensitive to light. Some other starfish have 11 to 13 rays, and some resemble five-sided pin cushions in form. The brittle starfishes have a central disk, with long, slim, muscular rays by means of which they move. Their tube-feet are not developed. All starfishes possess the power of restoring, or regenerating, lost or injured parts. See ECHINODERMATA and SEA-URCHIN. Consult Romanes' *Jelly-fish, Star-fish and Sea-Urchin.*

Stark, John, an American soldier, was born at Londonderry, N. H., Aug. 28, 1728. He served in the French-and-Indian wars and at Ticonderoga in 1758. At Bunker Hill he was colonel of a regiment which he had enlisted; and was at the front in the attack on Trenton and in the battle of Princeton. He raised a new regiment in 1777, and was given command of the New Hampshire troops sent against the British troops from Canada. On Aug. 16, 1777, he fought the battle of Bennington (known in New York as Walloomsac), receiving for it the thanks of Congress and the rank of general. With a new force recruited by him in New Hampshire he cut off Burgoyne's retreat from Saratoga, and after serving in Rhode Island and New Jersey had charge in 1781 of the northern department, with headquarters at Saratoga. He died on May 8, 1822, the last but one of the generals of the Revolutionary army. See *New Hampshire Soldiers in the War* by Hammond and *Life of John Stark*, by Edward Everett, in Sparks' "American Biography."

Star'ling, a name for a number of common birds found only in the Eastern hemisphere, but lacking in Australia. This is the more remarkable as a starling is found in New Zealand, and others in various southern Pacific islands. The common starling of Europe is the best known. It is a beautiful bird with a dark plumage, having metallic green and purple reflections, and each feather tipped with buff. It nests near houses in bird boxes, when they are provided, and is easily tamed. It can be taught different notes and also



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SEA URCHINS AND STAR FISH.

to speak words; it is therefore often caged. They kill an immense number of insects and are beneficial to the gardener. A starling inhabiting the steppes and plains of Western Asia devours so many locusts that it is called the locust bird. The ox-pecker of Africa is also a starling.

Stars, those heavenly bodies which appear as bright points having fixed positions in the sky. The spectroscope in the hands of Fraunhofer, Huggins and others has shown that these so-called fixed stars really are gigantic and very distant suns; for they give continuous spectra crossed by dark lines, indicating, as in the case of our central luminary, a solid or liquid core surrounded by incandescent vapor.

Ptolemy and Hipparchos divided the stars visible to the naked eye into six different groups, according to their brightness. These groups are called *magnitudes*, and since the invention of the telescope this classification has been so extended that astronomers grade stars into 14 or 15 groups. In the first magnitude they place the 14 brightest stars, including Sirius, Vega, Arcturus etc.; in the second group are 48 stars, including the Pole Star and two Pointers; in the third 152; in the fourth 313; in the fifth 854; and in the sixth 2,010, making a total of 3,391, which are practically all the stars which can be seen without the aid of a glass. The number of stars which can be photographed, or which can be seen with our largest refracting telescopes, runs into the millions. The distances of the fixed stars are known only in a few cases, and even then very roughly. This quantity is determined by measuring the annual parallax of the star, a quantity which, except in a very few cases, is so minute as not to exceed the errors of measurement. The nearest star, so far as known, is *a* Centauri, whose parallax is only ¾ of a second of arc, and even this, our nearest neighbor, is at the stupendous distance of four "light-years," *i. e.*, at a distance such that light would require four years to traverse it.

The student should bear in mind that, although these stars are said to be fixed, most of them exhibit, in fact, a small amount of motion, say, a second or so in a year. In addition to this motion across the heavens, which is measured in angle and is called *proper motion*, nearly all stars exhibit a motion toward us or away from us, which is called *motion in the line of sight*. The measurement of this latter motion is one of the recent achievements of the spectroscope, based on Döppler's principle. Consult Miss Clerke's *System of the Stars;* Chambers' *The Story of the Stars;* Lockyer's *Meteoric Hypothesis;* and Scheiner's *Astronomical Spectroscopy*. See NEBULA, PARALLAX and TELESCOPE.

Star-Span'gled Banner, The. Words by Francis Scott Key, adapted to the old air *Anacreon in Heaven*. This air was the constitutional song of The Anacreontic Society of London, always sung by an official of the society at the supper with which it was customary to close the musical season, near the end of the 18th century. The tune was probably composed by Doctor Samuel Arnold (1740–1802). It became known in America in 1798, being sung at an anniversary meeting of the Massachusetts Charitable Fire-Society, to words by Thomas Paine, who later changed his name to Robert Treat Paine. Subsequently there were settings of other words to this tune, popularly known as *Adams and Liberty*. Further details regarding the tune and Key's words may be found in a pamphlet by Stephen Salisbury, Esq., of Worcester, Mass., and in *The National Music of America and its Sources* by Elson, Boston, 1899. See KEY, FRANCIS SCOTT.

Stat'en Island, the chief island in New York harbor, forming Richmond County, N. Y. and the borough of Richmond in the enlarged city now known as Greater New York. It received its name from early Dutch settlers in honor of the states-general (Dutch *Staten*). It has an area of 58½ square miles, and is about 13 miles in length and eight in breadth. It is separated from Long Island by the narrows and from New Jersey by the Kill von Kull and Staten Island Sound, and has steam-ferry communication with New York City and with New Jersey, while the Staten Island Rapid Transit Railroad reaches the towns, villages and watering places of importance on the island. Close to Clifton is Fort Wadsworth, and on the north shore is Sailor's Snug Harbor, an asylum for aged and infirm mariners. At Stapleton is a United States marine hospital, and between St. George and Tompkinsville is a United States light-house-station. On the island are the residences of many of the business men of New York City. Population 67,000.

States Gen'eral, The. In France the convocation of the representative body of the three orders of the French kingdom (representing the nobility, the clergy and the bourgeoisie) for deliberating on matters of public importance. It corresponded somewhat to our Congress. Under Charlemagne the national assembly was made up of nobles and clergy, a practice continued till about 900. Thereafter we have no trace of such an assembly in France till 1302 when Philip the Fair revived the states general, including representatives of the citizens because he hoped to gain their support in his struggle with Pope Boniface VIII. During the Hundred Years' War (1337–1453) it played an important rôle in connection with the revenues and taxation. It was not yet a law-making body. As kings gained power, backed by a standing army, they grew more inde-

pendent and the states general was not convoked from 1614 to 1789, when the refusal of the citizen members to count the vote by orders initiated the French Revolution. Thereafter the representative assembly of France took on various names, usually The National Assembly.

In Holland the name of states general is applied to the legislative body of the kingdom. It is composed of two houses, the upper elected by the provincial states and the lower chosen by the citizens.

States' Rights, a term used in the United States to indicate a doctrine, based upon an understanding of the constitution, which assumes that the different states of the Union are independent and that the citizens of a state owe allegiance only to the state; that the states are joined together only for certain purposes; and that the acts of the general government must be approved by the separate states, which possess the right also to nullify or pronounce them of no authority or, if necessary, to secede from the Union. The first appearance of this idea was in 1798, when the legislatures of Kentucky and Virginia protested on this ground against the alien and sedition laws which permitted the president of the United States to remove from the states aliens or foreigners whose presence might be considered dangerous and to punish sedition in the states. In 1811 and in 1819 the matter recurred in connection with the United States Bank charter, Henry Clay and Maryland claiming that the government had no authority to create a bank. In 1832 South Carolina attempted to carry the principle into action by pronouncing the high tariff "null and void" and not binding on its citizens. The passage of a compromise tariff-law settled the trouble for that time. In 1860–61 the southern states carried out the principle by seceding from the Union, and their action was followed by the Civil War.

State Univer'sity of I'owa, located at Iowa City, was founded in 1847. It comprises a college of liberal arts, including civil and electrical engineering, colleges of law, medicine, dentistry, pharmacy and a school of pedagogy. It is open to students of both sexes, and has an attendance of 2,072, with a faculty of 150 and a library of 65,000 volumes. Its productive funds amount to $240,320; its income in 1907 was $324,048.

Statics (*stăt'ĭks*), a branch of mechanics. In pure mechanics (or dynamics, as it is frequently called), the effects of forces upon bodies are considered. If the effect of forces upon a body is to change the rate of motion of the body, the forces acting are said *not* to be in equilibrium. Forces and effects of this kind are studied under the head of kinetics. In all other cases forces are said to be in equilibrium and are studied under the head of statics. If one hold a steel-spring in his hands and bend it, he recognizes that there are forces acting upon the spring by the fact that the shape of the spring is temporarily changed. These forces do not produce any motion in the spring; they are in equilibrium. It is this group of forces which is considered under the head of statics. For another illustration allow a locomotive to stand at rest on a steel bridge. The bridge sags slightly as the locomotive takes up its position. But the upward force with which the bridge tends to regain its original shape is exactly equal and opposite to the weight of the locomotive. These stresses produced by the locomotive and the strains which result from them illustrate the kind of problems studied under the title of statics.

Statics may, therefore, be defined as the science of the equilibrium of forces. It is very important in this connection for the student to distinguish carefully between a body which is at rest and one which is in equilibrium. A pendulum bob at the end of its swing is in rest; but it is not in equilibrium, for at that very instant it is being set in motion by its weight. The two general conditions of equilibrium for any body are that the sum of all the forces acting upon the body shall be zero and that the sum of all the moments of force acting upon the body shall be zero.

The application of these general principles to the cases of simple machines, as the lever, inclined plane etc., is the portion of statics ordinarily studied in physics; while the application of these principles to various structures, as bridges, roofs etc., is the part of statics which is pursued by engineers. The conditions under which fluids remain in equilibrium form the science of hydrostatics.

Stevinns (1548–1603) showed that a force can be completely represented by a straight line. Upon this simple fact a branch of mathematics called graphical statics has been recently founded, and has furnished many elegant geometrical solutions of engineering problems. For an unusually interesting history of statics see Mach's *Science of Mechanics.* Minchin's *Treatise on Statics* (Clarendon Press) contains an extraordinarily clear presentation of the entire subject.

Staunton (*stan'tŭn*), **Va.,** a city, the seat of Augusta County, on the Chesapeake and Ohio and Baltimore and Ohio railways, over 110 miles northwest of Richmond. It has waterworks and an electric-light plant, both of which the city operates, substantial public buildings, the city-hall, court-house, churches and schools, a Masonic Temple and a military academy etc. It is the seat of the Western State Hospital for the Insane, the Virginia School for the Deaf and the Blind, Virginia Female Insti-

tute and Cary Baldwin Seminary. The city manufactures (besides agricultural implements and machine-shop products) organs, overalls and wagons; it also has a flour-mill and a planing-mill. Population 11,500.

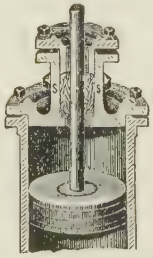
Stead, William Thomas, an English journalist, was born on July 5, 1849, at Embleton, Northumberland. At 14 he became merchant's apprentice and at 22 editor of *The Northern Echo*, Darlington. In 1880 he became associate-editor of the *Pall Mall Gazette* and in 1883 the editor. In 1890 he founded *The Review of Reviews*, one year later *The American Review of Reviews* and in 1893 *The Australian Review of Reviews*. In 1895 he began the publication of the *Masterpiece Library of Penny Poets, Novels and Prose Classics*. His interests have been social and broadly democratic. For one of his publications against existing social evils, *The Maiden Tribute of Modern Babylon*, he was put in jail for three months. His efforts in the interest of international peace have been untiring. His more important publications are *The Truth About the Navy*, *Truth about Russia*, *The Pope and the New See*, *The Story that Transformed the World*, *If Christ came to Chicago*, *The Labor War in the United States*, *Satan's Invisible World*, *A Study of Despairing Democracy*, *The United States of Europe*, *Mr. Carnegie's Conundrum*, *The Conference at the Hague*, *The Americanization of the World*, *The Last Will and Testament of Cecil John Rhodes*, *The Despised Sex* and pamphlets against the Anglo-Boer War.

Steal Away, American Negro Song, published in *Jubilee Singers of Fisk University* by G. D. Pike. S. Coleridge Taylor has also made a transcription of the melody in his *Twenty-four Negro Melodies, transcribed for the Piano*.

Steam is the vapor of water. Water gives off vapor without being heated, but this process is usually called evaporation, and the word "steam" is limited to the vapor which arises from boiling water. Steam is lighter than air, and occupies much more space than water; a cubic inch of water will make nearly a cubic foot of steam. Water boils at 212° F. and makes steam, which has the same temperature as the water, but really contains more heat, so that the steam from a boiling teakettle will burn more severely than the boiling water. This extra heat is called latent heat, because it does not affect the thermometer. The boiling temperature of 212° F. is practically constant in vessels which have a free outlet for the steam; but in closed vessels, like boilers, the boiling-point may be raised, and much pressure is produced at the same time. The pressure increases faster than the temperature; for instance, the pressure at the boiling-point is one atmosphere, but it becomes two atmospheres at 249°, four at 301° and twenty at 444°. When the engineer opens a valve to let off steam, the rushing noise it makes shows its power. Steam is used to produce motion, as in the locomotive and other machines; in heating houses; and in other operations where heat is required.

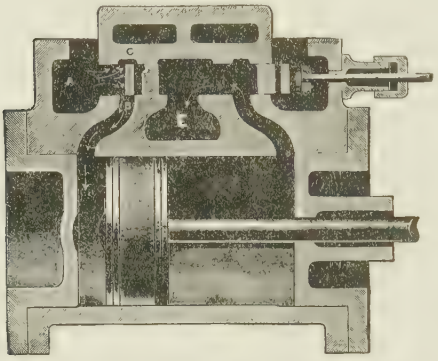
Steamboat. See STEAMSHIP.

Steam-En'gine, an apparatus for doing mechanical work by means of heat applied to water. The steam-engine is a form of heat-engine, of which the gas-engine and hot-air engine are two other commercial forms. The first steam-engine dates back to the second century before Christ in the toy æolipile of Hero and in conjuring apparatus used by priests. The beginning of the modern steam-engine was in the water-raising engine of Thomas Savery in 1698. In this the steam acted directly on the water to be raised. The first use of the piston was by Papin in 1705 in a modification of Savery's engine. In the same year Thomas Newcomen made a piston-engine which more nearly approached our modern form. It was, as its name implied, an atmospheric engine. The piston working in a cylinder was connected by a chain with one end of an overhead beam. Steam admitted from the boiler to the cylinder allowed the piston to be raised by a heavy counterpoise hung from the other end of the beam. Then the valve was shut and the steam in the cylinder condensed by a jet of cold water. This left a vacuum in the cylinder and the piston was forced down by the pressure of the atmosphere, and work was done by lifting a pump-rod which was fastened to the other end of the beam. The common story is that a lazy but ingenious boy named Humphrey Potter, who had been set to turn the valve, made the engine close and open its own valves by means of cords and thus invented the first automatic valve-gear. Newcomen's engines were used solely for pumping water from the English collieries. The modern steam-engine is due to James Watt (*q.v.*), an instrument-maker for the University of Glasgow. Watt's great advances were (1) condensing the steam in a separate vessel called the condenser, thus keeping the cylinder hot, (2) adding an air-pump to help to maintain the vacuum of the cylinder and remove the condensed steam, (3) jacketing the cylinder to prevent cooling off by conduction and radiation, (4) making the engine double-acting, that is, forcing the piston back not by the atmosphere but by steam admitted at the other end of the cylinder and (5) using the steam expansively, in other words, stopping the



PISTON AND CYLINDER

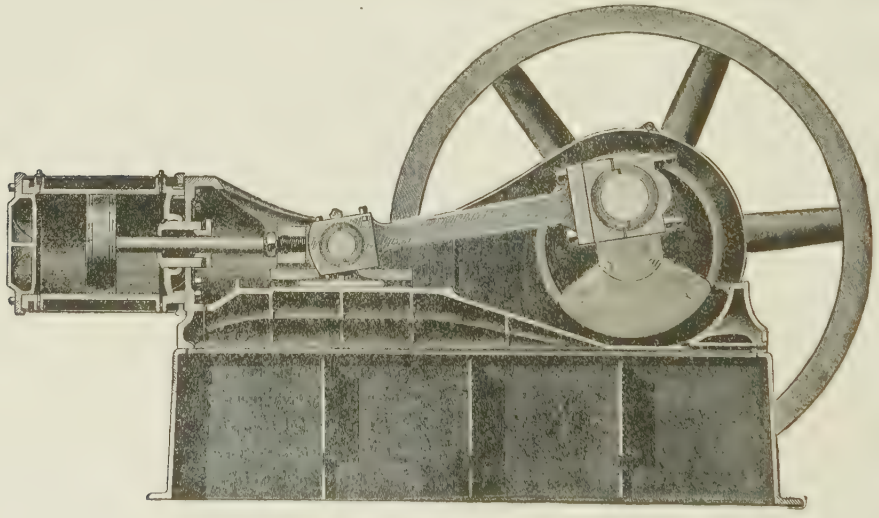
admission of steam when the piston had made only a part of its stroke, and allowing the rest of the stroke to be performed by the expansion of the steam already in the cylinder. He also made many inven-



PISTON-CYLINDER AND SLIDE-VALVE

tions of important details, as the throttle-valve for regulating the admission of steam, the centrifugal governor (see GOVERNOR), the indicator for studying the actions in the cylinder (see INDICATOR), and, in conjunction with Murdoch, the slide-valve for controlling the admission and release of steam. He also patented the use of two or more successive cylinders on one engine, or the modern compound-engine plan, which is used in all large engines where economy of fuel is important. Watt's inventive career extended over more than a half century, and he is rightly called the father of the modern steam-engine. For the full history of the steam-engine see Thurston's *Growth of the Steam-Engine*.

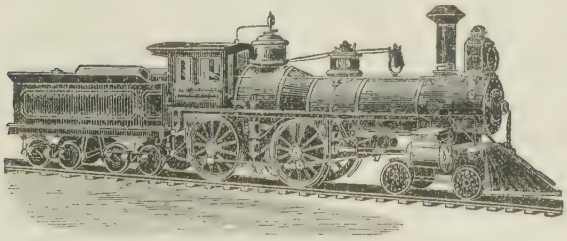
The action of a simple steam-engine with the slide-valve, one of the simplest forms, can be easily studied from the diagram. This is a horizontal section of a cylinder, showing the piston in the cylinder and the valve below. As shown, the piston has reached the extreme left of the cylinder, and the port B on the right is connected with the exhaust E. This exhaust connects with the atmosphere in noncondensing engines, or with the cold condenser in condensing engines. Live steam is at the same time entering the left end of the cylinder at B from the steam-chest A, thus moving the piston back to the right. The time of the admission and cut-off of the steam and the connection with the exhaust is fixed by the mechanism which moves the valve. The number of valve-mechanisms in use is very great, but they all serve the general purpose seen above. Among the best known valve-mechanisms is that due to George H. Corliss. In the Corliss valve-mechanism there are two separate ports at each end of the cylinder, one for the steam-chest and one for the exhaust. This or a modified form is often used on large engines. To convert the straight-line backward-and-forward motion of the piston into rotary motion, a connecting rod and crank on a fly-wheel are used. The efficiency of a steam-engine depends largely upon allowing the steam to expand so far as possible, so that its temperature and pressure are as low as possible when it leaves the cylinder. Steam is consequently not used at full pressure through the whole stroke, but connection with the steam-chest is cut off at a proper fraction of the stroke and the piston is then moved by the expansion of the steam. Steam-



SECTION OF STEAM-ENGINE

engines are rated in horse-power, one horse-power representing the work of 33,000 foot-pounds per minute. (See DYNAMOMETER.) The performance of a steam-engine is indicated by the pounds of steam or water it consumes per horse-power per hour. For noncondensing engines 35 lbs. of steam at 100 lbs. pressure is a common performance. The best large condensing engines give records of from 17 to 20 lbs. of steam at 100 lbs. pressure for one horse-power for one hour. The following are terms used to designate different forms of engines. Horizontal, inclined and vertical refer to the position of the cylinder. High and low, as applied to speed, are relative terms. A speed of 150 revolutions per minute is a medium speed. Much above or below this is called high or low. Noncondensing and condensing are terms referring to the exhaust. In a noncondensing engine the exhaust is directly into the air; in a condensing engine the exhaust steam is condensed usually by contact with cool running water. Simple and compound are terms referring to the number of expansions used in the engine. In a simple engine there are a single cylinder and a single expansion; in the compound engine there are at least two cylinders and two expansions. Compound engines are more economical. Rotary engine is a form of engine in which the piston rotates. In the common steam-engine the piston moves backward and forward. A rotary engine has the very decided mechanical advantage of compactness and of direct application of power without crank and fly-wheel, but no rotary engine of the many that have been invented has ever shown itself economical or durable, except the steam-turbine. (See TURBINE.)

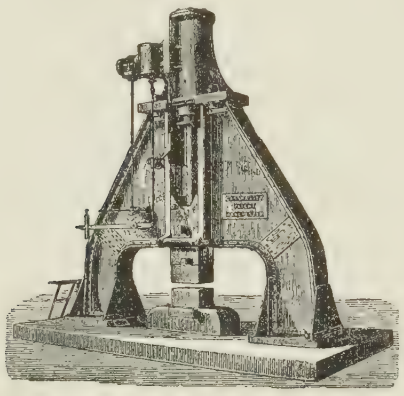
A LOCOMOTIVE is a steam-engine so arranged with wheels as to drive itself on an iron or steel track. As a steam-engine the locomotive has a number of special features. It carries its furnace and boiler with it, and must also be supplied with an auxiliary car or tender for carrying water and fuel. The engine is double, that is, there is a high-pressure cylinder with piston on each side of the locomotive. Many modern locomotives are also compound steam-engines, that is, the steam-expansion takes place in two cylinders, a high-pressure and a low-pressure cylinder. The steam-pressures commonly used are from 150 to 200 pounds per square inch. The oscillating, straight-line motion of the piston is converted into the rotary motion of the driving wheels by the usual mechanism of a cross-head and crank. The engine must be reversible. This is accomplished by a link-motion due to Stephenson, by which the connection of the valve-mechanism with the driving parts can be shifted through an angle. A requirement of the locomotive is the development of a large power in a limited space and with a limited weight. This means the burning of a large amount of fuel per square foot of grate-area, and requires forced draft. It is accomplished by exhausting steam directly into the smoke-stack. The American and European locomotives differ little as steam-engines, but present quite different external appearances. The large cab for the engineer, the pilot or cow-catcher, the headlight, the prominent whistle and bell are striking external features of the American locomotive. The frame of the engine and boiler is also quite different, that of the European locomotives being more rigid than can be used on American railroad-tracks. The first successful locomotive is due to George Stephenson (*q. v.*), and was used to haul coal for the Killingworth colliery in 1815. At the opening of the Stockton and Darlington railroad, an English line of 37 miles opened in 1825, a Stephenson engine, weighing eight tons and capable of 16 miles per hour, was used. Of the early locomotives R. Stephenson's *Rocket* was one of the most famous. At a competitive trial of locomotives in 1829 this engine showed a speed of from 25 to 30 miles per hour. These early locomotives are pygmies compared with the heavy, high-speed machines of to-day. Speeds of 100 miles per hour have been frequently exceeded in the last few years by express-locomotives. The largest locomotive in the world is one in use on the Illinois Central Railroad for hauling freight-trains over some steep grades on its line. It was built by the Brooke Locomotive Works, and weighs, without tender, over 230,000 pounds. The largest locomotive works in the world are the Baldwin Works at Philadelphia, Pa.



A. P. CARMAN.

Steam-Ham'mer, a hammer which is raised by the direct action of steam on a piston in a steam-cylinder. It is used in forging iron, particularly for large and heavy work. The first idea of the steam-hammer is due to James Watt, but the first practical scheme of a steam-hammer is due to James Nasmyth (*q. v.*). His first machine was made in 1843. The piston moved by steam raises the hammer-head or "tup," until the steam is cut off and allowed to

escape, when the piston with the tup falls, striking the object placed on the hammer. The blows may be so regulated as just to crack an egg or to strike with a force of tons. In modern steam-hammers the force of the blow is increased by the pressure of the steam above the piston, and by automatic valve-mechanisms the blows can be repeated with great rapidity. The largest



STEAM-HAMMER

steam-hammer ever built is that built for the Bethlehem Iron-Works in 1891. The piston with tup weighs 125 tons, the cylinder has a diameter of 76 inches, and the length of the stroke is 16½ feet. Such large hammers are no longer used, as the work is done better and cheaper by large hydraulic presses. The Bethlehem steam-hammer has been superseded by a 14,000-ton hydraulic press.

Steam'ship, a vessel moved by steam. A half-successful experiment was made by Papin to use steam to propel a boat as early as 1707, but it was not until the perfecting of the steam-engine by Watt that any advance was made in steam-navigation. Early inventors of steamboats were William Henry, 1783, and John Fitch, 1785–96, in the United States and William Symmington and Henry Bell in Great Britain, but the first steam-vessel to make a voyage of any considerable length was the *Clermont*, made by Robert Fulton in 1807. She was 133 feet long, and made the voyage of 150 miles from New York to Albany in 32 hours. In the same year Col. John Stevens built at New York the *Phœnix*, which was taken around to Delaware River by sea because Fulton had a monopoly of steam-navigation on the Hudson. This was the first steamboat to make a sea-voyage. The first passenger steamboat in operation in Europe was the *Comet* on the Clyde in 1812, although a successful boat had been on the Clyde Canal as early as 1802. The first steamship to cross the ocean was the *Savannah*, a ship of 350 tons, which made the voyage from Savannah, Ga., to Liverpool and thence to St. Petersburg in 1819. Both sails and steam were used. The voyage to Liverpool was made in 25 days. The first vessels to cross the Atlantic using steam the whole distance were the *Great Western* and the *Sirius*, which reached New York on the same day, April 23, 1838. Since then the transatlantic steamship-service from New York has been continuous. All the earlier steamships were propelled by wheels at the side or at the ends. The screw-propeller was introduced by Smith and Ericsson about 1840 (see SCREW-PROPELLER), and since then all ocean-steamers and many inland steamers use it. Iron and steel have superseded wood for large ships, and steamships have continued to grow in size, power of engines and speed. The voyage from New York to England is now made in four days and fifteen hours by the fastest ship or in seven days by the slow steamers. The largest and fastest steamers on the ocean to-day are the *Deutschland*, length 686 feet, displacement 23,000 tons, average speed 23.36 knots per hour, H. P. of engines 35,000; *Oceanic*, length 704 feet, displacement 28,000 tons, average speed 20.48 knots per hour, H. P. of engines 28,000; *Lusitania*, 790 feet long, 32,000 tons' displacement and average speed 25,05 knots

STEAMSHIP LUSITANIA

an hour; and *Mauretania*, 790 feet long, 32,000 tons' displacement and average speed 24.86 knots an hour. Each of the last two steamers has 70,000 horse-power. The White Star Line is building two Atlantic liners of 42,000 tons' burden each and over 900 feet in length. The *Mauretania* and *Lusitania* are quadruple-screw turbines and are not merely floating hotels or palaces but cities at sea. The average daily coal-consumption of the

Deutschland is 570 tons. In the United States, steamship-building has until recent years been largely confined to vessels for inland waters. The river steamboats of the United States are fine examples of boat-building. They must ascend rivers against strong currents, and often need to travel in shallow waters and carry large amounts of freight or tow large fleets of barges. This has developed a large vessel of only a few feet draught and with very powerful engines. On the western rivers most of the boats have stern-wheels. The steamers on the Great Lakes rival ocean-steamers in speed, size and equipment. Most of them are engaged in the transportation of grain and of iron-ore. Since 1883 ocean-steamship building in the United States has developed largely, owing to the impetus given by the construction of the large government cruisers and warships of "the new navy." The largest and finest commercial steamships built in the United States are the *Minnesota* and her sister-ship, built at New London, Conn., for the Pacific trade, the former being 630 feet long and having, when built, the greatest depth of any ship on the ocean. See NAVY, SHIP, SHIPBUILDING and TURBINE.

Steam-Shov'el and Dredge, a machine, worked with crane and steam-power attached, mounted on wheels for running on rails, and used for excavating clay, sand, gravel or other soil in railroad or other cuttings; also used for river-dredging, the deepening of canals etc. by a suction-process. The steam-shovel in use for heavy work has a boom, usually made of strong steel-girders, with a powerful thrusting-engine for giving ample scooping-force to the shovel, the latter generally being provided with heavy, pointed teeth for excavating loose rock. The bottom of the shovel or bucket is hinged, so that, when filled and raised, its contents are released by pulling a latch-cord and dumping the load into cart, car or other vehicle for removal. The thrusting of the shovel, as well as the hoisting and dumping, is the work of the attached engine, working along the movable crane. With a 2½ or 3 cubic-yards' shovel about 2,400 cubic yards of sand and 600 of loose rock can be excavated in ten hours. For dredging river-bottoms and delivering the mud or other material on shore, machines with belt-conveyors are used, different in pattern and varying in capacity and rapidity in work. Some varieties deliver to the shore or to a scow alongside by gravity, by means of an extensible sheet-iron trough or sipper-shovel of large dimensions.

Steam-Turbine. See TURBINE.

Steam-Whis'tle, a mechanism attached to the steam-boiler in a railway-locomotive, marine engine etc., through which the escaping steam, issuing from a narrow annular orifice in a hemispherical cup, strikes the thin edge of a bell on top and produces a loud, more or less prolonged whistle, which serves as signal or warning.

Sted'man, Edmund Clarence, an American poet was born at Hartford, Conn., Oct. 8, 1833. He studied at Yale, and began his literary career as a journalist, acting as correspondent for *The New York World* during the Civil War. He also contributed to magazines. His first volume of poetry, published in 1860, was rapidly succeeded by others. *Victorian Poets*, which has gone through several editions, appeared in 1875, and *Poets of America* in 1885. With Ellen M. Hutchinson he edited *The Library of American Literature*, and he also brought out a Household Edition of his poems. Other works edited by him include *A Victorian Anthology*, *An American Anthology*, *Poe's Works*, *Landor's Poems* and *Aldrich's Poems*. He died on Jan. 18, 1908.

Steel is iron carbonized. It is of several sorts, each possessing special properties and being made by a particular process; is extremely elastic; and has greater tensile strength than any other metal. No law of connection between its composition and its properties has been discovered, and carbon's form in steel remains undetermined. The term formerly designated a carbonized iron that would harden when heated to a certain temperature and then suddenly cooled; but only carbonized iron produced by modern methods is now considered steel. Iron is used in the industrial arts as cast-iron, wrought iron and steel, and each has marked physical properties that fit each for special purposes.

Cast iron is produced by heating iron-ores to a high temperature in a blast-furnace in connection with various fluxes, particularly limestone. The molten metal contains considerable carbon dissolved and, usually, silicon, phosphorus and sulphur. The amount of carbon in cast iron varies from 1.5% to 4.5%. Cast iron can be melted and cast in molds. It is only slightly malleable, except when specially treated, is rigid and has great resistance to crushing, but is more or less brittle and not adapted to tensile strains. Wrought iron is nearly pure iron, and in modern metallurgical processes is usually obtained by removing the carbon and other impurities from cast iron. The common method of making wrought iron is that of puddling. This consists of melting cast iron in the chamber of a flame-furnace (see FURNACE) and in removing the carbon, phosphorus etc. by stirring the molten metal and, sometimes, by adding oxidizing materials. Wrought iron is very malleable, can be welded, has a high tensile strength and shows a fibrous rather than a crystalline structure at a break. Steel has been made since very early times by a

process called cementation. This consists of taking a high grade of wrought iron rolled into bars, putting these in fireclay boxes with finely divided charcoal and heating them from three to six days. This recarbonizes the iron, and produces cement or blister-steel. Bars of blister-steel may be welded together (then called shear-steel), or they may be melted in crucibles and cast, and are then called crucible-steel. High-grade tool and spring steel is made by this process, while the cheaper open-hearth and pneumatic processes are used in the manufacture of the great quantities of steel used in engineering construction-work.

The pneumatic process, universally called the Bessemer process, was invented by William Kelly (*q. v.*) of Pittsburgh in 1847, and ranks among the most important of industrial achievments The discovery was an entirely new idea, revolutionized steel-making, and supplied the most useful and precious of metals cheaply as well as abundantly. Without such steel modern railways and steamships and much machinery would be impossible. Years before Bessemer of England experimented in iron, steamers on the Ohio had boilers of iron refined by Kelly's process. This consists of burning pigiron's impurities away by blowing fine aircurrents (whence the term pneumatic) through the melted metal and pouring back the needed amount of carbon. Bessemer discovered the process in 1855, and invented machinery that made it a commercial success. Mushet perfected the process chemically. The operation is performed in a pear-shaped pot, the converter, commonly 15 feet high by eight across, which since 1858 has but slightly changed its form. It is made of boiler-plate and lined with refractory material. When the iron turns white, it has become steel, and is poured out and worked. Bessemer steel lacks sufficient hardness for every purpose. Steel for hammers, knives, springs and a thousand finer articles, must be made by slower and more careful methods. Hence it is manufactured on the open hearths of flame or reverbatory furnaces by melting cast-iron, scrap-iron and wrought-iron together. In reliability and uniformness openhearth steel surpasses bessemer, but bessemer is the steel for engineers and builders.

Within 15 years steel has largely superseded brick, stone and wood in bridges and great buildings, ships being built of steel almost exclusively. Pittsburgh began about 1885 to produce beams, girders and other structural shapes; in 1892 production by automatic machinery displaced production by men; and American cities have since been rebuilt in steel. Barrels, bathtubs and furniture are now made of steel, as are cars, cotton-bands, roadways, sleepers and ties. Corrugated sheet-steel replaces wooden siding in buildings; expanded steel, a mesh of ribboney laths; ornamental steel-ceilings, plaster. Steel-frame churches have been erected, and New York's subway is a steel-tube.

No industry equals that of iron and steel in numbers, organization and wealth. America in its 5,370 establishments, produces nearly half the steel of the world. Pittsburgh makes more iron and steel than Great Britain, Chicago ranking second and making a third of our rails. The total value of the industry, whose movement is toward the lakes, is two billion dollars.

Though steelmaking has been revolutionized, vaster changes impend. The rolling-mill will become even more automatic. The important problems are the improvement of the quality of steel and the protection of workmen. The Bessemer converter is being replaced by the open hearth. A process has been invented, the duplex, that combines the pneumatic and openhearth methods. Less and less coal is needed in ironmaking, while oil, gas and electricity supply additional fuels or new processes and means. Highclass steel said to equal crucible-steel has been made directly from iron *ore* by an electric process. Finally, since dry air produces a hotter fire, with less fuel, than damp air, a process has been invented that takes the moisture, no small item, from air blown into the furnace, and the process increases production nearly a fifth.

Steel=Build'ing=Construc'tion, a method of constructing tall city-buildings by building a framework of steel to carry floors and floor-loads, and walling this framework in with a wall of light brick or stone work. These buildings differ from the older buildings in that the masonry walls do not carry the loads of the building. They really are an application of the method of the steel-bridge to architecture. The office-buildings of Chicago, New York and other American cities are the best examples of this new architectural method. Among the tallest of these buildings are the Metropolitan Life-Insurance Building, New York City, 46 stories or 700 feet in height; the Singer Building, 41 stories or 612 ft. 1 in. high; and *The Times Building*, 28 stories or 419 ft. 9 in high.

Steele, Sir **Richard,** a British author, was born at Dublin, Ireland, in March, 1672. He studied at Oxford, but in 1694 suddenly enlisted in a troop of horse-guards. His pamphlet known as *The Christian Hero* was published in 1701, followed by very different work in the shape of three plays, *Grief à la Mode*, *The Lying Lover* and *The Tender Husband*. In 1706 he received a court appointment under Queen Anne and the post of gazetteer, with a salary of $1,500, which, with two wealthy marriages, one in 1705 and the other in 1707, gave him ample means. Dissipation, however, kept him in

pecuniary trouble most of the time, his life being spent, as he says, "in sinning and repenting." On April 12, 1709, appeared the first number of the famous *Tatler*, a tri-weekly paper, which was followed in March, 1710, by the more famous *Spectator*, in turn succeeded in March, 1713, by the *Guardian*. Addison (*q. v.*) a friend and schoolmate of Steele, was his valued and valuable assistant in all these enterprises; as he said: "I fared like a distressed prince who calls in a powerful neighbor to his aid; I was undone by my auxiliary; when I had once called him in, I could not subsist without dependence on him." The characters of Sir Roger de Coverley and Will Honeycomb are said to have been first suggested by Steele, and his fame rests mainly on the essays contributed to these papers. His political career in Parliament ended in impeachment and expulsion for what were considered treasonable writings in *The Crisis*, a pamphlet published by him in 1717 and answered by Swift. He again entered Parliament after the death of Queen Anne, was knighted by George I, and in 1722 published his best comedy, *The Conscious Lovers*. He died on Sept. 1, 1729. See *Memoir* by Austin Dobson, in the English Worthies Series; and *Life* by Aitken.

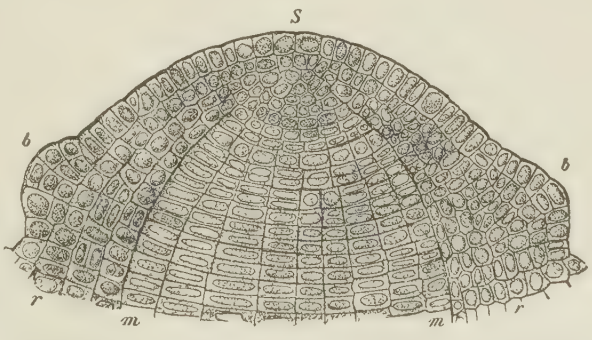
Steel'ton, Pa., a borough of Dauphin County, on Susquehanna River and the Pennsylvania Canal, three miles southeast of Harrisburg, with which it is connected by electric railway. Here is the large plant of the Pennsylvania Steel Company, engaged in the manufacture of Bessemer steel, for rail, bridge and construction works. It has, besides, saw, planing and flour mills. It is served by the Pennsylvania and Reading railroads. It has a number of churches, schools, banks, and other public buildings. Population 13,911.

Stein (*stīn*), **Heinrich Friedrich Karl, Baron von,** a Prussian statesman, was born at Nassau, Germany, Oct. 26, 1757. He entered the service of Prussia in 1780, and in four years was head of the mines in Westphalia. He was called in 1804 to be head of the department that controlled customs, taxes and trade, but being unable to work with the king he resigned in 1807, while in retirement writing an essay on political reform. Before the year was ended, however, Frederick William III had to recall him, and in less than a year Stein carried out the measures he had planned, which laid the foundation of Prussia's greatness. He abolished the remains of serfdom, did away with privileged classes and all monopolies, and supported the army reforms But Napoleon, who had advised his recall, now fearing him, insisted upon his dismissal, and in 1808 he withdrew to Austria and finally to Russia, after having issued his *Political Testament*. He was influential in forming the union against Napoleon. After his return to Prussia he established a society for publishing the historical documents of Germany. He died in Westphalia, June 29, 1831. See *Life and Times of Stein* by Seeley.

Stele (*stēl*) (in plants). The mature stems and roots of higher plants have three great regions. The outermost is the epidermis; next within is the cortex; while the central or axial region is the stele. The stele is derived from the plerome (which see), and is characterized by developing the vascular bundles. To it also belongs the pith of dicotyledonous stems. In the trunk of an ordinary tree the epidermis has disappeared; the cortex is mostly represented by the corky part of the bark; while the whole mass of wood and the inner fibrous bark belong to the stele.

Stelvio (*stĕl'vē-ō*), **Pass of,** is the highest carriage-road across the Alps, remarkable for its beautiful scenery. It is 9,042 feet above the sea, 33 miles long, and forms part of the great road between Milan and Innsbruck.

Stem. In general, the axis part of a differentiated shoot, and in this sense it includes the shoot axis of mosses and leafy liverworts. Its special application, however, is among fern-plants and seed-plants, in which group the vascular system is developed. In structure there are several distinct types of stems, but they are all developed in the same general way. At the growing tip of the stem there is a single cell (most *Pteridophytes*) or a group of cells (some *Pteridophytes* and all *Spermatophytes*) known as the apical cell or cells. These apical cells are meristematic, and by their division organize the two or three great regions of the stem. In the stem of an ordinary seed-plant the three embryonic regions, beginning at the outside, are the dermatogen, periblem and plerome (see all three). The dermatogen gives to the epidermis, the periblem to the cortex, and the plerome to the stele. The chief differences



Vertical section of stem tip, showing growing point (*s*), forming leaves (*b*), cortex (*r*), and central cylinder (*m*), in which the woody bundles are to appear.

among stems consist in the various organizations of the vascular or woody tissues in the stele. For example, in the *Gymnosperms* and *Dicotyledons* the woody bundles are organized into a hollow cylinder, within which is a definite pith; while in the *Monocotyledons* the woody bundles are scattered in the stele. The usual function of stems is to display foliage leaves; but sometimes they become much modified, especially when subterranean. In this case they are usually used for the storage of reserve food, and become variously thickened and distorted, being called tubers, rootstocks (rhizomes) etc.

Stephen (*stē'ven*), the first Christian martyr, was one of the first seven deacons chosen by the church at Jerusalem at the instance of the Apostles. (*Acts vi*). He was a popular preacher who grasped the meaning of the great revolution which Christianity had brought into the Mosaic institutions. He was accused of blasphemy, and, before he could finish a speech in his own defense, was hurried outside the city-walls and stoned to death while praying for his accusers. (*Acts vii: 60*). He is celebrated in the Roman and Anglican churches on December 26th, in the Greek church on the 27th.

Stephen, king of England, was born at Blois in 1105. He was the grandson of William the Conqueror and nephew of Henry I of England. On the death of Henry Stephen claimed the throne, though he had taken the oath of allegiance to his cousin Matilda, on whom Henry I had settled the succession. He was crowned on Dec 26, 1135, but never received the confidence of his people. The kingdom was badly governed, the nobles and clergy were against him, and he had to struggle with Matilda for the throne. In 1141 Stephen was taken prisoner and Matilda acknowledged queen. He was exchanged for Robert of Gloucester, the queen's brother. The queen left England, and Stephen reigned quietly until 1152. Henry, the son of Matilda, then contested the throne and the long struggle ended in Stephen making Henry his heir. King Stephen died at Dover, October 25, 1154.

Stephens, Alexander H., an American statesman, was born in Georgia in 1812. He was a member of Congress from 1843 to 1856. He was opposed to secession and made a speech against it before the legislature of Georgia in November, 1860, and, when a delegate to the secession convention at Milledgeville in January, 1861, voted against the ordinance of secession. He was, however, elected vice-president of the Confederacy, and was one of the prominent statesmen of the seceding states. He was imprisoned at Fort Warren in Boston harbor for five months at the close of the war. He was in Congress from 1874 to 1882, when he was elected governor of Georgia. He died at Atlanta, Ga., March 4, 1883. In 1867-70 he published *A Constitutional View of the War between the States*. See *Life* by Cleveland.

Stephens, James. See FENIANS, ENGLAND, GREAT BRITAIN and IRELAND.

Ste'phenson, George, is usually spoken of as only the inventor of the locomotive, with the implication that it required no extraordinary genius to adapt the stationary engine of Watt to the work of locomotion. That is not true. There were difficulties to overcome that scientific men long thought to be insuperable — the direct transmission of power to the wheels and the securing of sufficient friction between wheels and rail to prevent slipping. The fact that Stephenson also invented the rail and roadbed and initiated the entire system of civil engineering as applied to railroad-building is commonly overlooked to-day. During his life the two achievements were inseparable and equally honored, as they should continue to be. Without the properly constructed, level road-bed, laid with iron rails, the locomotive must long have remained of limited use.

GEORGE STEPHENSON

Of all the great inventors Arkwright alone had as humble a beginning as Stephenson. To be born the son of a fireman of a colliery's pumping-engine, whose earnings never exceeded three dollars (12 shillings) a week, would seem to condemn one to a life of poverty, ignorance and obscure toil. It was on the 9th of June, 1781, that George Stephenson was born in the wretched mining-village of Wylam, near Newcastle, England. One room in a cottage, near the pit-mouth, that sheltered three other families was the home of his parents and six children. School was not to be thought of; bread was not always to be had in sufficent quantity. In this grimy village he spent his babyhood; childhood saw him below ground. At 14 he was promoted to be his father's assistant at a shilling a day. At 17 he himself was an engineman at two shillings, with his father under him as fireman. He began at once to study his steam-pump. Every idle day he spent in taking it to pieces, cleaning and repairing it. Eager to add to his knowledge of engines and steam he hired a poor schoolmaster to teach him to read. He soon raised himself to manager of the hoisting-engine at the pit-mouth. Thorough preparation and one step at a time marked his entire life. At 23 he was in charge of a Watt-engine in a spinning-mill. At 32

he was earning $500 a year, and the first use he made of it was to put his son Robert to school. At night he continued his own education under the boy's instruction. Father and son read, drew, modeled and experimented in physics together.

About this time a locomotive having a toothed wheel to grip a toothed rail was installed in a neighboring colliery. Stephenson thought a smooth wheel would run on a fairly level road, the weight of the engine supplying the necessary friction. In 1815 he patented his first model in which, in addition to the smooth wheel, he incorporated the principles of high steam-pressure by using the waste steam as a blast. He also secured simple and direct transmission of power to the wheels and joint-action of all with the connecting-rod. The multitubular boiler, so as to expose a larger surface to the fire, was added later. Having invented the locomotive, he had next to train workmen, as did Watt, to make it properly. Above all, he had to find a partner to supply the money. Next he turned his attention to the railroad. Long experiments were necessary before the first wrought-iron rail was laid with specially invented joints. The next difficulty was the securing of a level road-bed. The first railroad he built was one of eight miles in length for a colliery. Stationary engines were used to pull the loaded cars up steep gradients. In descending the cars ran by gravity and pulled empty cars up a parallel track. In 1825 Stephenson built his second short railway for a colliery district, attained a speed of 15 miles an hour on level stretches, and started a factory for building locomotives. Then came the first passenger-and-freight line between Liverpool and Manchester and the first attempt at modern railway engineering The work involved carrying the line across Chat Moss, a stretch of bog-land, making a deep cut through the red sandstone of Olive Mount and tunnelling under Liverpool for a mile and a half. In this work Stephenson displayed a resolution, a resourcefulness and an ability to control men and initiate methods then unheard of in modern life. The line was opened in 1830, with eight of Stephenson's engines of the *Rocket* type in the procession. His work called forth the most extravagant praise and wonder. It was compared in magnitude and difficulty with the work of ancient Egypt and Babylon. Yet this was only a beginning. Forty-nine years old at the time of the opening of the Liverpool and Manchester Line, Stephenson continued to build roads and locomotives and to improve them and to overcome greater engineering difficulties for the next 15 years. His surplus wealth and leisure he employed in developing coal-mines, burning lime and managing a large country-estate. He made flying trips to Europe to lay out the first lines in Belgium and Spain. He bridged Menai Straits at Holyhead, Anglesey, and carried a railroad across. He lived to see his son succeed him worthily. He died on August 12, 1848, honored as much for his character as for the benefits he conferred. Consult *Life*, in *Heroes of Science*, by T. C. Lewis and *Life* (revised edition) by Smiles in Volume III of *Lives of Engineers*.

Stephenson, Robert, the son of George Stephenson, was born near Newcastle-upon-Tyne, England, Oct. 16, 1803. He helped his father in the survey of his first railroad and spent three years as civil engineer in South America. On his return he had charge of his father's locomotive-works and assisted in building the famous *Rocket*, which won the prize as the best engine at the opening of the first passenger railroad in England. He was his father's assistant in all the railroad-building that followed and rose to the highest rank in his profession. Among his great works are Britannia and Conway tubular bridges, the Victoria bridge at Montreal and two bridges across the Nile at Damietta. He was a member of Parliament, received many honors from abroad, and at his death, Oct. 12, 1859, was buried in Westminster Abbey. See *Lives of Engineers, Volume Five*, by Smiles and *Life of Robert Stephenson* by Jeaffreson.

Stereopticon (*stĕ'rĕ-ŏp'tĭ-kŏn*). See MAGIC-LANTERN.

Ste'reoscope, an instrument which combines two different pictures of the same object into one, making it appear solid. Two photographs are taken of the object, one as it appears when looked at with the right eye and the other as it looks with the left. These are transposed, that is, the right picture placed on the left and vice versa, mounted, and introduced into an instrument having a double lens or a single lens cut in two, which makes the two images blend into one and stand out as they seem to when looked at by the eye alone. The lenses act as magnifying glasses, and also incline toward each other, which helps to blend the pictures The stereoscope was first invented in 1838 by Sir Charles Wheatstone. See *Stereoscope* by Brewster.

Ste'reoty'ping is the art of making solid casts of pages of movable type, to be used in printing. When the pages of matter to be printed are ready for the press, casts are taken from them, either in type-metal or in copper. Type-metal, which is used in stereotyping, is an alloy of lead, antimony, tin and, sometimes, copper, and is much cheaper than copper, which, however, is the more durable and so is used where large numbers are to be printed. Taking the casts of the printed sheets in copper is called electrotyping (which see). Stereotyping was invented by William Ged, an Edin-

burgh goldsmith, about 1725. A cast is first made by pouring a mixture of plaster of paris and water over the types and, when it is hardened or set, taking it off and drying it in an oven. This cast, which is a perfect copy of the page to be printed, is dipped into the melted type-metal, forming a cast of the metal, which is trimmed and planed to fit the block on which it is to be mounted. This cast is called a stereotype plate. The process used now is the invention of Genoux in 1829, called the *papier maché* process. It is much cheaper and more rapid, and has come into general use. Folds of soft, thin paper, pasted together and wet, are laid on the face of the type and beaten with a hard brush, so as to fit in all the holes in the type. The hollows made in this way on the outside of the paper are filled with clay and brown paper pasted over, and the whole is dried till it can be lifted off the type, when the cast of type metal is made from it by pouring in the hot metal. The paper cast can be kept and any number of new casts made from it. In printing newspapers the stereotype plates are made to fit round a cylinder, and the paper is pressed into the holes of the type by a roller. In large newspaper-offices a cast can be made in three to five minutes. See *Stereotyping and Electrotyping* by Wilson.

Ster'ilizing Processes are intended to destroy the micro-organisms to which fermentations and often diseases are due. Louis Pasteur (see PASTEUR INSTITUTE) was the originator of the theory and practice of these processes. Milk is the chief food which needs to be sterilized, both for the wide range of its use and the nature of the diseases which it may help to convey, as consumption, typhoid fever, diarrhœa in children, scarlet fever and cholera. Milk may be pasteurized at a temperature of 167° F. Boiling and treatment with superheated steam are even surer methods. Freezing assists to sterilize milk; but is less sure. Water is most conveniently sterilized by boiling. There can be no doubt that sterilization is one of the great, general advantages of the process of *cooking* food. Chemicals ought not to be used in sterilizing processes; for it is necessary to employ them, if at all, in quantities too large for health.

Ster'ling, Ill., a city in Whiteside County, on Rock River and the Chic., Burl. and Quincy and Chic. and Northwestern railways, 110 miles west of Chicago. Among its public institutions it includes good schools and a well-equipped library. Its industries embrace machinery, hardware, agricultural implements, paper and flour mills, canned goods, watches, caskets and a foundry. Population 6,309.

Stern'burg, Hermann von Speck, a German diplomat, born at Leeds, England, in 1852, and educated in Saxony and at Potsdam Military Academy. He took part in the Franco-Prussian War in the 2d Dragoons of Saxony, and in 1890 was drawn to official life, first as secretary of the legation at Peking, and secondly as *chargé d'affaires* at Belgrade, Servia, and then as first-secretary of the embassy at Washington, D. C.; subsequently becoming envoy extraordinary to the United States in 1903 and, in the same year, ambassador. In 1898 he acted on the Samoan Commission, and in 1900 was consul-general for British India and Ceylon. He died in 1908.

Sterne, Laurence, a British writer, was born at Clonmel, Ireland, Nov. 24, 1713. He studied at Cambridge and became a clergyman. In 1759 he wrote the first two volumes of the *Life and Opinions of Tristram Shandy*, which has made him forever famous. Its success was signal and he became the "lion" of the fashionable world. The other two volumes followed in the same year and were as heartily welcomed as the earlier ones. The remainder of the work, which reached nine volumes, was written at Coxwold, where he had moved from his Yorkshire parish. *A Sentimental Journey through France and Italy*, published in 1768, was the result of a tour through those countries in 1765. He also published two volumes of sermons. His fame rests on his humor and the immortal characters of Corporal Trim, Yorick and My Uncle Tobey, found in *Tristram Shandy*. He died at London, March 18, 1768. See *Life* by Fitzgerald and *Sterne*, in the English Men of Letters Series, by Traill.

Stettin (*stĕt-tēn'*), a Prussian city, is the capital of Pomerania. It is on the Oder, 60 miles northeast of Berlin. The citadel and several forts which formed the ancient fortifications were removed in 1874. The churches of St. Peter (1124) and St. James, founded in the 14th century, the palace, town-hall, two ornamental arches and several fine squares are among the noticeable features. It is one of the chief seaports of Germany, and manufactures soap, matches, clothing, sugar, paper, sewing-machines and bricks; has oil-refineries; and engages extensively in shipbuilding. Stettin was the seat of a princely dynasty, 1107-1637; was occupied by Sweden, 1648-1720; and by the French, 1806-13. Population 224,119.

Steu'ben, Frederic William Augustus, Baron, a general in the Revolutionary War, was born at Magdeburg, Prussia, Nov. 15, 1730. He served when only 14 in the siege of Prague, and rose in the army until in 1752 he was on the staff of Frederick the Great. He came to America in 1778 and offered his services to Washington, who gladly accepted them, as it was in the dark days of Valley Forge. He was appointed inspector-general, and remodeled the army. He took part in the siege of Yorktown, and

spent his whole fortune in clothing his men. Congress in 1790 voted him $2,400 yearly and a township of land near Utica, N. Y., where he died on Nov. 28, 1794. See *Life* by Kapp.

Steu'benville, O., a city, county-seat of Jefferson County, is on the Ohio, 68 miles below Pittsburgh, by rail 43 miles from Pittsburgh. It is in a rich farming-country, with large coal-mines and natural gas, and has a large trade. It stands high on the right bank of the river, is well laid-out, and has foundries, machine-shops, rolling-mills, tin and paper mills, blast-furnaces, boiler-works and factories of nails, glass, pottery, white lead and beer. The city is built on the site of Fort Steuben, which was erected in 1787 and named after Baron Steuben. The permanent settlement was made in 1797. It is served by three railroads and three interurban lines. Population 22,000.

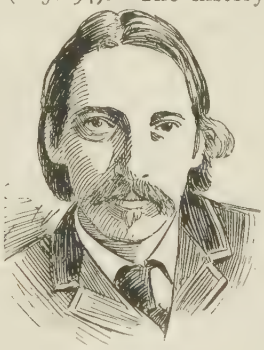
Ste'vens, Alfred, an English sculptor, was born at Blandford, Dorset, England, in 1818. His great work, which ranks him among the great sculptors of England, is the monument of Wellington for St. Paul's Cathedral, London, one of the finest pieces of modeling in England in the 19th century. It was begun in 1856, but was left unfinished at his death on May 1, 1875. In 1892 it was moved from the side chapel, where it had been almost hidden, to the place for which it was originally intended. See *Alfred Stevens* by Stannus.

Stevens Point, Wis., a town, county-seat of Portage County, is on Wisconsin River, 161 miles northwest of Milwaukee. It has a lumber-trade and a number of lumber-mills, besides furniture-factories, foundries, machine-shops, railroad-shops and flour-mills. It has public and parochial schools, a high-school, a commercial school and public library. One of the normal schools of Wisconsin is at Stevens Point.

Stevens, Thaddeus, American statesman, Republican and antislavery man, was born at Peacham, Vt., April 4, 1792, and died at Washington, D. C., Aug. 11, 1868. After graduating in 1814 at Dartmouth College, he studied law and practiced at Gettysburg, Pa., and was subsequently drawn into politics, serving for a time in the state legislature in the Whig interest and becoming an active advocate of the public-school system. In the Whig interest he later served several terms in Congress, and meanwhile removed to Lancaster, Pa., where he rose to a prominent position at the bar. In Congress, in 1850, he opposed the Clay compromise measures, including the fugitive-slave law. In 1858 he was returned to Congress as a Republican, and became one of the ablest leaders of that party, manifesting great powers as an orator. He was a pronounced advocate of emancipation and the enfranchisement of the negro; was bitterly hostile to the seceding states; and stringent in his proceedings against them. He lived to take an active part in the unsuccessful impeachment of President Johnson and to see the readmission into the Union of the first group of reconstructed states. Though skeptical in his religious opinions, he was reverent in his attitude to Christianity — the devout faith of his mother. Part of his estate he bequeathed to an orphan-asylum at Lancaster, Pa., to be open both to white and colored children.

Ste'venson, Adlai E., was born in Christian County, Ky., Oct. 23, 1835. After graduating at Central College, he studied law and was admitted to the bar in 1858. He began the practice of law in Metamora, Ill., and remained there for ten years. He then removed to Bloomington, and was elected Congressman for that district in 1874 and 1878. He was appointed first assistant postmaster-general in 1885 by President Cleveland, and in 1892 was elected vice-president of the United States on the Democratic ticket with Grover Cleveland. He was candidate for governor of Illinois in 1908.

Stevenson, Robert Louis Balfour (1850-94). The history of English literature records no braver story than the life and work of this blithe story-teller, tender poet and charming essayist. Born in Edinburgh, Scotland, November 13, 1850, he spent much of his childhood in bed, with but the frailest hold on life. He died at the early age of 44. Within a period of 20 years, while waging one long fight with death, he produced an enormous quantity of work of enduring quality. Constant pain and over-powering weakness he did not permit to affect a cheerful spirit, nor to quench the flame of joy that burns in every line he wrote. In the autobiographical poems entitled *A Child's Garden of Verse* Stevenson shows how, shut-away from ordinary childish pleasures, he created a wonder-world of romance out of the simplest things. His bed was "the *pleasant* land of counterpane," not a weariness. Always happy, he was a source of happiness, if of anxiety, to his father and mother, to good Aunt Balfour and to his Scotch nurse who never had the heart to be cross with the "wee, winsome laddie."



ROBERT STEVENSON

When he grew older, he was able to take the course in Edinburgh University and to study engineering and law, but no regular study was possible in childhood. So he lived

much of the time in a beautiful country home or took journeys with his father, a civil engineer, inspecting lighthouses and harbors about the wild coast. In this way his brain was filled with images of mountain, moor and sea-girt isles, rather than with the symbols in books. His frail health very early settled the question of his carrying on his father's business of engineering or of practicing law. At 24 he was ordered south. Under that title his first essay appeared in an English magazine. "Ordered South" practically was a sentence of death from tuberculosis. The essay recognized this, but it was brave in tone, of polished style, exquisite in its English. The joyous spirit of the youth, pulsating with keen life, refused to accept the verdict. Always afterward he was journeying southward in search of warmer climes, to France, the south of England, California and finally to Samoa in the South Pacific, his heart hungering for Scotland to the last.

That exquisite little classic, *Will o' the Mill*, was published in a magazine in 1877; then came essays, short stories, books of travel. By 1880 his talent had developed to the point of producing *The Merry Men*. In the next ten years *The New Arabian Nights*, *Treasure Island*, *Dr. Jekyll and Mr. Hyde*, *Prince Otto* and *The Master of Ballantrae* followed each other in rapid succession, with *The Child's Garden of Verse*, short stories, poems, essays, each more brilliant than the last and presenting a new facet of his mind. In *Kidnapped* (1886) he made Alan Breck, his hero, say: "Am I no' a bonnie fighter?" In 1890 the sympathy and affection of the English-speaking world followed their "bonnie fighter" across the South Seas with the shadow of death in pursuit. He asked but to live, to love, to work. He gained four years more for heroic struggle on the seagirt mountainside, at Vailima, above Apia. There, in "plain agony of body," when at times the composition of a paragraph made him break into a cold sweat, he wrote *The Island Nights' Entertainment*, *Catriona*, *St. Ives* and *Vailima Letters*, and began *Weir of Hermiston*. Everything he wrote gives the impression of life at full flood, as if he enjoyed the writing as much as we the reading. The story was the thing. He had no lesson to teach, except that of intense interest in life and men and events; joyousness, gay courage, comradery, unselfishness, the adding of a little pleasure to the world's store.

So he died on Dec. 3, 1894, the flame bright till the last moment. His wife and mother and step-children, who had lived but for him, unable to remain where he had passed away, abandoned the South-Sea home to the wild. Him they laid away on Vaea Mountain, Samoa. Forty natives who had loved him cut a path to the summit with their knives and axes. There he lies to-day in the green place of trees and birds and wind-swept solitude in a wide prospect of mountain, sea and sky, with one of his own brave verse for an epitaph:

> Under the wide and starry sky
> Dig the grave and let me lie.
> Glad did I live, and glad will I die,
> And I lay me down with a will.

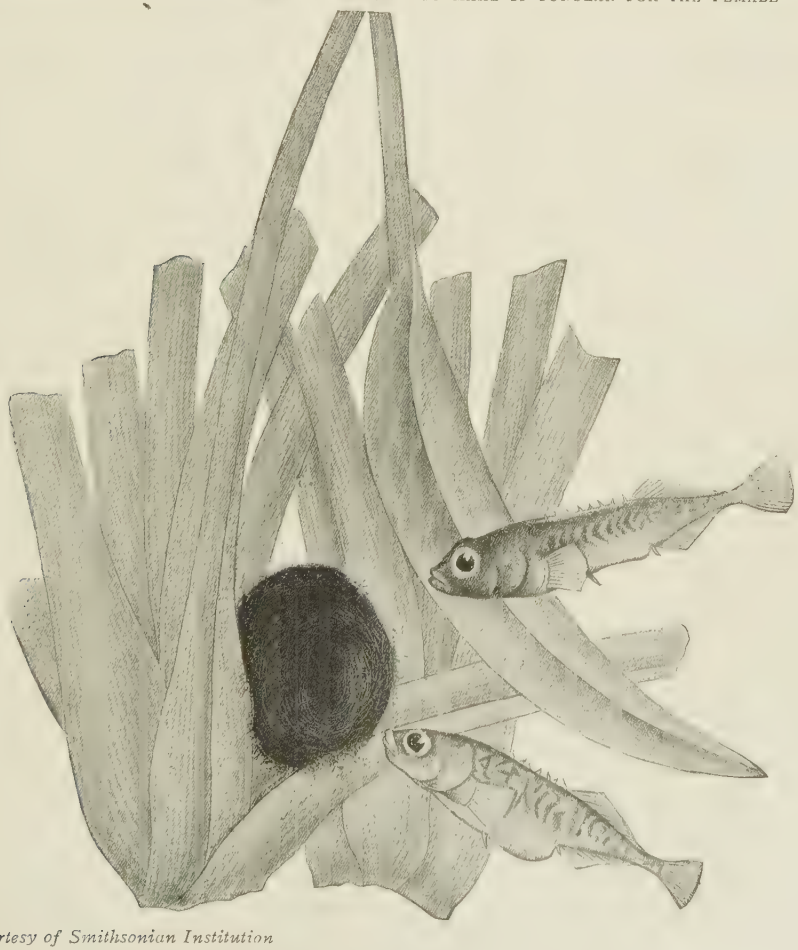
Stevinns, Simon, a Dutch mathematician, statesman and soldier, born 1548; died 1620. Very little is known of his early career. His achievements principally are the following: 1. He invented a number of ingenious proofs for certain theorems in statics and hydrostatics. He also constructed a carriage which was successfully operated by sails. 2. He left an important treatise upon the subject of fortifications. 3. He introduced and advanced the use of (but did not invent) the system of double-entry in bookkeeping and the use of decimal fractions. He held a number of important offices under the Dutch government. For a detailed account of his work in science see Mach's *Science of Mechanics*.

Stew'art, Balfour, a British scientist, was born at Edinburgh, Nov. 1, 1828. In 1859 he was in charge of Kerr Observatory, and in 1870 was professor of physics at Owens College, Manchester. He is known as one of the founders of spectrum-analysis, and his name is associated with such subjects as terrestrial magnetism and the relation between sun-spots and temperature. His *Treatise on Heat*, *Elements of Physics* and *Conservation of Energy* were used as textbooks. He died at Drogheda, in Ireland, Dec. 19, 1887.

Stewart, William Morris, United States senator and lawyer, was born at Lyons, N. Y., Aug. 9, 1827, spent his early life in Ohio, and entered Yale College; but before graduating was attracted by the gold-discoveries in California, and proceeded thither in 1850. He mined in Nevada County and amassed wealth, after which he studied law and was admitted to the bar. In 1854 he was attorney-general; but some years later he removed to Virginia City, Nev., and became interested once more in mining and in the development of the famous Comstock lode. In 1861 he was chosen a member of the territorial council, and two years later member of the constitutional convention. From 1864 to 1875 he was United States senator, and became prominent as a free-coinage advocate. Meanwhile he resumed the practice of his profession, though, in 1887, he was again elected to the United States senate.

Stickleback (*stĭk'k'l-băk'*), the name for small fishes with spines on the back. There are about 20 species, all inhabiting the northern hemisphere, and their spines vary from two to 15. They live in fresh, brackish and salt waters. The common fresh-water

STICKLEBACK MALE ROTATING IN HIS NEST TO MAKE IT TUBULAR FOR THE FEMALE



Courtesy of Smithsonian Institution

FEMALE PREPARING TO ENTER A NEST TO LAY HER EGGS

stickleback is about four inches long, with three or four spines. It is abundant in streams in the United States and in Europe. In America it ranges from New York to Greenland. The brook-stickleback is abundant in small brooks from New York to Kansas and north to Greenland. Its length is two and one half inches, and there are five spines on the back. The largest stickleback is the many-spined stickleback, a salt-water fish found on the eastern side of the Atlantic. Nearly all sticklebacks are nest-builders. The males alone build the nests and guard them. They are provided with glands which open on the ventral surface, secreting a gelatinous substance used in holding the parts of the nest together. The nest is made of stems of water-plants and is attached to a stationary object. It is barrel-shaped with two openings, through which a current of water continually passes. Several females deposit eggs in one nest in different layers. They are fertilized by the male as soon as laid. He keeps guard, not only while the eggs are hatching but after the young fish are born.

Stig'ma (in plants), a specially constructed surface in connection with the carpel, for receiving the pollen. The surface is composed of papillate outgrowths which secrete a sugary solution. By means of this solution the pollen-grains are held and nourished for the development of the pollen-tubes. The stigma usually occupies some special region of the style, either its more or less broadened apex or a line or band down one side. See FLOWER.

Stilicho (*stĭl'ĭ-kō*), **Flavius,** a famous Roman general, was born about 359 A. D. He rose rapidly, and in 384 was sent as ambassador to Persia. In 394 he was governor of the western empire, as guardian of Honorius, the son of the emperor, who had been given into his charge by Theodosius. On the death of Theodosius he marched against Alaric, and also procured the death of Rufinus, his rival, who had command of the eastern empire. He again attacked Alaric in northern Italy, defeating him at Pollentia and Verona (403). He desired to help his own family to the imperial succession by marrying his son to the daughter of Theodosius, as he had already succeeded in marrying his daughter to the son of Honorius. To forward this plan he made an alliance with Alaric, but the great inroad of 200,000 barbarians compelled him to abandon his alliance. He forced them to surrender, and large numbers were sold as slaves. Honorius, the emperor, was excited against Stilicho by an enemy of his at court, and the army was induced to revolt. Stilicho fled to Ravenna, where he was murdered on Aug. 23, 408. Three months after his death Alaric and his Goths were at the gates of Rome.

Still'water, Minn., county-seat of Washington County, on St. Croix River, 18 miles by railroad from St. Paul. It has the lumber trade of the St. Croix valley, and has flour mills, sawmills, a foundry, an extensive traction-engine and thrashing-machine factory, shoe and wood-furnishing factories and the Minnesota prison. Population 12,458.

Stipule (*stip'ūl*), a constituent part of many foliage-leaves, usually occurring as a pair of small, more or less leafy outgrowths on each side of the base of the petiole, as in clover. Sometimes stipules become much modified, as when, in the smartweeds they unite about the stem and form a short sheath, or when they appear as thorn-like processes. They are very constant in their occurrence in certain groups of plants, and therefore are of considerable service in classification.

Stir'ling, a town of Scotland, on the River Forth, 29 miles from Glasgow. The castle stands on Castle Hill, 420 feet above the sea. Most of the present castle belongs to the days of the Stuarts, whose sovereigns often kept court there. There are the Douglas room where Earl Douglas was stabbed by James II in 1452; the parliament-hall of James III; the palace of James V and the chapel of James VI; the church of the Holy Cross; the statue of Bruce; the guild-hall; the old and the new bridge; and Smith Institute, with art-gallery, reading-room and museum. The town is connected with nearly all the most important events in Scottish history: the deaths of Alexander I and William the Lion; Wallace's victory at Stirling Bridge; a siege of the castle by Edward I; the birth of James II and of James V; crowning of Queen Mary; the slaughter of Lennox; and the capture of the castle by Monk. Stirling has manufactures of tartans, tweeds, carpets and agricultural implements. Population 18,895. See *History of the Chapel Royal of Stirling.*

Stirling, James Hutchinson, a modern Scottish philosopher, was born at Glasgow, June 22, 1820. He studied medicine and practiced a short time in Wales. He went to Germany to study philosophy, his first work, *The Secret of Hegel,* published in 1865, giving him at once a high rank among philosophers. He has also written a *Textbook to Kant; Sir William Hamilton,* an attack on his philosophy of perception; *Lectures on the Philosophy of Law;* and *As Regards Protoplasm.* Other miscellaneous works are *Jerrold, Tennyson, Macaulay* and *Burns in Drama.*

Stock'holm, the capital of Sweden, is built on several islands and a part of the mainland, between a bay of the Baltic and Lake Malar. It is considered one of the most picturesque sites in Europe. The palace, dating to 1697, St. Nicholas church in which the kings are crowned, the House of Nobles, the town-house and a mag-

nificent granite quay are on the island called the Town; the Knight's island, west of the Town, is occupied by public buildings, as the houses of parliament, the old Franciscan church in which many of the kings of Sweden have been buried, and the chief law-courts. In Norrmalm, a district north of these islands, are the national museum with very valuable collections of antiquities, coins and paintings, the academy of fine arts, Hop Garden with a statue of Linnæus, the Royal Library of 250,000 volumes and an observatory. Ship Island, lying east of the Town island, is the headquarters of the Swedish navy, and still farther east is the beautiful island of the zoölogical gardens. The islands are connected with each other and the mainland by bridges, and small steamers ply rapidly between them. The islands and channels make Stockholm the Venice of the north. Though the harbors are closed for three or four months every winter, there is a large trade, with considerable manufacturing of sugar, tobacco, silks, ribbons, candles, linen, cotton and leather. Stockholm was founded by Birger Jarl in 1255, besieged by the Danes in 1389, and captured by Christian II. of Denmark in 1520, when a terrible massacre followed, known as "the bloodbath of Stockholm." The city contains 332,738 inhabitants, the mass of whom are Scandinavians and Protestants and adhere to the Lutheran church. There are a state faculty of medicine with 273 students and a private philosophical faculty. Public elementary education is free and compulsory, and all children not attending the public schools must furnish proofs of having been privately educated. See SWEDEN.

Stock'port, a city in England, 37 miles east of Liverpool. It is built on the slopes of a deep ravine where two small rivers unite to form the Mersey, which is here crossed by a railroad viaduct, 111 feet high and 1,875 feet long. There are a 14th-century church, rebuilt in 1817, market-hall, free library, museum and St. Peter's square, with a statue of Richard Cobden. Stockport was the site first of a Roman station, then of a Norman castle, which was taken by Prince Rupert in 1644. It is an important seat of the cotton-industry, and has grown rapidly in spite of riots and strikes and the cotton-famine of 1861–4. There also are iron and brass foundries, engine and machine shops. Population 99,646.

Stock'=Raising. One of the most important industries in the United States; closely associated with agriculture, though some stock is yet sent to market directly from the western pasture-lands. East of the Alleghenies not much stock is raised for market, but large herds of dairy-cattle are found, while every farm has a few horses, hogs, sheep and cows to supply home needs. The Mississippi Valley and the western plains produce vast wealth in stock every year.

In America the pig has been coëxtensive with Indian corn, the greatest of food-crops. Consequently Chester County, Pa., developed the first truly American breed of swine, the Chester White, while Miami Valley, Ohio, about 1860 produced the well-known Poland China hog. The Miami Valley then was the world's corn and hog center, Cincinnati the chief American market. As the prairie states, however, were settled, a sudden change occurred in stock-raising. Indian corn spread to the arid plains, the bison disappeared and the steer and the hog followed corn to the boundary of cultivation. Then the ox went alone across "the Great American Desert" to the Rockies, and from 1870 to 1890 countless herds of cattle grazed from the Rio Grande to Canada. By 1900, however, the settlement even of "the far west" had ended this free ranging. Now the range-business is confined to producing feeders and shipping them eastward to be fattened in the corn-belt of Iowa and Illinois. The ruined grazing-lands of the southwest are being restocked with native grasses, and in Montana, North Dakota and South Dakota horses are raised on the prairie-pastures as extensively as cattle and sheep once were.

So American stock-raising has developed into the most gigantic live-stock industry ever known. The grass-lands of the far west and the corn-belt of the central west complement each other, each supplying what the other lacks. Land unfit for cultivation, where grass is cheap but corn and shelter wanting, is utilized for producing cattle and sheep. Breeding-herds that supply superior sires and dams are raised in the corn-belt, and this is the finishing or fattening ground for the stock from the western ranches. So Chicago, Omaha and Kansas City have become the markets for this immense industry. (See STOCK-YARDS). The prairie-pastures can, indeed, fatten sheep, finish many kinds of horses or even put fairly-good cattle into the market; but the cost of shipping live-stock from the range to the finishing ground is so great that live-stock must both be produced and finished at each place. Consequently farmers are breeding their own stock and developing it as part of the system of enriching their land. The meat-supply of the United States must henceforth be raised on the American farm; and live-stock is accompanied by leguminous crops (which animals alone can eat), which are the only feasible means of cheaply maintaining the nitrogen-supply and fertility of the soil. Hence stock-raising will play a larger and ever larger part in American farming.

The vastness of the live-stock industry in the United States is shown by the following statistics of domestic animals in 1907: Cattle (cows, bulls etc.) 72,533,996; horses and colts 19,746,583; mules 3,816,692; asses and burros 110,012; sheep 53,240,282; swine 54,794,439; and goats 1,948,952. See AGRICULTURE (*Stock-Breeding* and *Stock-Feeding*, p. 31); CATTLE; HOG; HORSE; MEAT-PACKING; MILK; MULE; SHEEP; SWINE; and WOOL.

Stocks are the rights in the property of a corporation which those persons possess who have contributed to its capital. Each corporation has a certain capital-stock which may be raised for the purposes of its business but need not be fully paid up. This amount is divided into shares. Certificates are made out for these shares, say $100 shares or $10 shares as the case may be. These certificates are sent to those who have paid up the capital, in proportion to the amount which they have paid. Thus if the stocks be at par, a man who had subscribed $1,000 to a certain stock would receive ten $100 certificates. But the business of the corporation may fall short of expectations; or it may exceed them. In the former case the value of the paper certificates will decrease; in the latter case it will increase. So a stock is rarely at par, *i. e.*, at such a mark that a hundred dollar certificate is worth exactly one hundred dollars. Stocks are liable to fluctuate in value not merely according to the value of the business which they represent, whether a mine, a railroad, a great commercial concern or what not, but according to the plentifulness or scarcity of money which is being invested.

There are many who almost gamble on the fluctuations of stocks. Some buy merely in order to sell; and it is to their interest to *bull* the stock or advance it in price. Others sell stock which perhaps they do not possess; believing that, by the time they will be compelled to hand over the stock, they will be able to buy it more cheaply than they have agreed to sell it. In the stock-market the former class are known as "bulls;" the latter as "bears." The mere manipulation of stock is undesirable. The member of the public who thinks that he can compete with the professional stockbrokers is likely to suffer heavy loss. He will do better to make a genuine investment in a stock, with the idea, not of selling, but of getting good interest on his money from the dividends which the stock pays out of the proceeds of the business which it represents. On every transaction in stock the buyer or seller pays one-eighth *per cent.* of the money which he pays or receives for the stock to a broker. The number of brokers in a stock-exchange is limited. Their seats are property, and may be inherited; but they are occasionally sold to a would-be broker. A seat in the New York Stock Exchange has sold for $88,000. See BOARD OF TRADE.

Stock'ton, Cal., county-seat of San Joaquin County, is on an arm of San Joaquin River. It has a good harbor, and the river is navigable at all seasons from San Francisco. The city is supplied with water by artesian wells. There are a convent, a state hospital and factories of ironware, woolens, flour, engines, cars, window-glass, leather, soap and carriages. The city is served by the Southern Pacific (Central Pacific), Santa Fé and Western Pacific railroads, as also by two traction-companies. Population 22,500.

Stockton, Francis Richard, American author and humorist, was born at Philadelphia, April 5, 1834, and, after graduating at the high school of that city, took to journalism as a profession and to contributing to the magazines. Joining the staff of *Scribner's Monthly*, he wrote much for it and *St. Nicholas*, of which he became assistant-editor. In this appeared many of his delightful stories for the young. He became a prolific and industrious author, his stories revealing quaint but unobtrusive humor, with a brightly graphic quality and a literary style that commend his work to the educated and refined. His more prominent works embrace *Rudder Grange*, *The Lady or the Tiger*, *Pomona's Travels*, *The Casting Away of Mrs. Leeks and Mrs. Aleshine*, *The Dusantes*, *The Great Stone of Sardis*, *A Bicycle of Cathay* and *The Captain's Toll-Gate*. He died on April 20, 1902.

F. R. STOCKTON

Stockton, Robert Field, an American naval officer, was born at Princeton, N. J., in 1795. He entered the navy in 1811, went to Africa in 1821, and helped to secure the republic of Liberia for the American Colonization Society. He was sent to the West Indies against the pirates and served in the Mediterranean. In 1845 he was sent to the Pacific coast, and next year, with Frémont, conquered California for the United States. In 1851 he was elected United States senator. He died at Princeton, N. J., Oct. 7, 1866.

Stock-Yards. Enclosures in cities where live-stock is cared for on its way to market or at market. With the development of the central and western states arose the necessity for convenient markets for distribution and sale of the enormous production of live-stock of these regions. (See

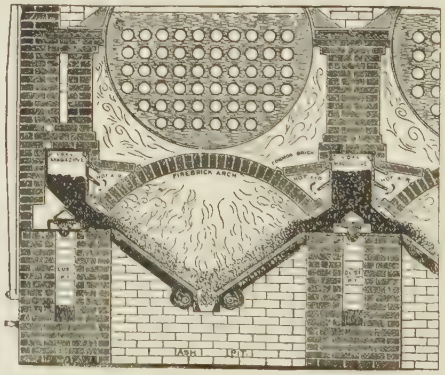
Stock-Raising). While all smaller cities had pens for the use of shippers and traders, great yards grew up in such centers as Cincinnati, Indianapolis, East St. Louis, Kansas City and Chicago, the latter outstripping all others, but those at Omaha and Kansas City being close seconds. Great slaughter- and packing-houses are found in connection with these large yards. The Union Stock-Yards of Chicago, with their 500 acres of yarding, 13,000 pens, 25 miles of street and 300 miles of railroad-track, are the largest live-stock market in the world. Thousands of carloads of stock arrive every day, most of it to be slaughtered, the remainder to be reshipped. The average number of hogs packed in Chicago annually for the past two decades is five million, considerably over one third of all packed in the world. In the year ending on March 1, 1907, there were 6,027,432 packed. The total value of the packing-house products of that city in 1905 was $262,586,609. There are 25,000 men employed. The disposition of filth from slaughter-houses has been a great sanitary problem. It has been almost completely solved, use now being made of every portion of the slaughtered animal. The strictest sanitary rules are enforced, and cleanliness prevails.

Stoddard, Charles Warren, an American author, was born on Aug. 7, 1843, at Rochester, N. Y. His education was obtained at the University of California. For some time he was an actor; then he became traveling correspondent of *The San Francisco Chronicle*. During this time he spent five years in the South Seas, and visited nearly every portion of the earth. He was professor of English literature at Notre Dame College, Indiana, from 1885 to 1887, and held the same position in The Catholic University of America at Washington, D. C., from 1889 to 1903. Among his publications are *South-Sea Idyls; Summer Cruising in the South Seas; The Lepers of Molokai;* and *Lazy Letters from Low Latitudes*.

Stod'dard, Richard Henry, American poet, critic and man-of-letters, was born at Hingham, Mass., July 2, 1825, and for a time attended school in New York, after which he worked as an iron-molder, meanwhile with love and assiduity cultivating the Muses. He subsequently held a position in the New York customhouse, was confidential clerk to General McClellan, city librarian in New York and reviewer for the New York *Mail and Express*. With poetic power, he possessed the true lyrical note, affluent imagination and much love of the beautiful. He was well-endowed as a critic, and his prose is that of a scholar and literary student. Many of his shorter poems have found their way into the heart, as *The Two Brides, The Flight of Youth, Along the Grassy Slope, Pain in Autumn* and *The Dead*. His chief published volumes embrace *The Book of the East, A Century After, Songs of Summer, Poems, Under the Evening Lamp, Adventures in Fairy-Land, The King's Bell, Life of Humboldt* and *Life of Washington Irving*. He also edited the *Bric-à-Brac* and *Sans Souci* series. He died on May 12, 1903. Consult his *Recollections*.

Sto'ics, philosophers who flourished first in Greece under Zeno, a native of Cyprus (340-260 B. C.), and later in Rome. They were so called from the porch or *Stoa Poacile* at Athens, where Zeno, their founder, walked and taught, with his chief disciples, Cleanthes and Chrysippus, developing and systemizing the Stoic doctrines. These doctrines sought to reconcile a theological pantheism and a materialist psychology with a logic which sought the foundation of knowledge in the perceptions of the senses and a morality which as its first principle claimed the freedom of the will. Zeno's associates, Cleanthes and Chrysippus, were taken to Rome by Panætius of Rhodes, one of whose disciples, Posidonius, instructed Cicero. Besides the latter, the other notable Roman Stoics who embraced Zeno's philosophy and made it a practical rule of life were Cato, Brutus, Seneca, Epictetus and Marcus Aurelius. Later Roman Stoics thought the supreme end of life was virtue; and that all emotion, being productive only of evil, must be subdued. This stringent attitude was by others relaxed, to the extent that their followers were advised to take part in political as well as social activities of all kinds — a departure, especially from the counsellings of the Epicureans, who on the contrary taught a life of retirement and contemplation.

Stok'ers (mechanical), an apparatus for feeding furnaces with coal by mechanism



GRATE-FEED OF A MECHANICAL STOKER

operated by power. Finely broken coal is used, and is ordinarily stored in elevated bins in front of or over the furnace. From these elevated bins it runs down through chutes into the coal-magazine of the stoker.

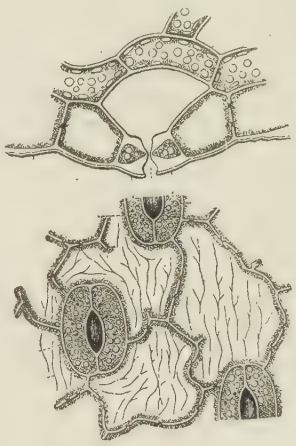
It is then fed regularly to the fire by some mechanism. In the Roney stoker coal is carried to the fire on a series of connected rocker-bars, arranged on an incline. In another common furnace the coal is pushed down the inclined sides of the furnace by an oscillating pushing-bar. The advantages of a mechanical stoker are that coal is fed more uniformly, smoking is decreased, a lower grade of coal can be used with advantage and hand-labor is saved. Mechanical stokers are to-day used in many large stationary furnaces.

Stoke-upon-Trent, a manufacturing town in Staffordshire, England, on Trent River. It is a modern town noted for its factories of porcelain, earthenware, tiles and tessellated pavements, which are among the largest in the world. Coal-mining, bricklaying and iron-works are also carried on. There are statues of Wedgwood and Minton in the city. Population 89,015. See *Borough of Stoke-upon-Trent* by Ward.

Stolon (*stō'lŏn*), a branch especially adapted for propagation, as in the ordinary houseleek. The houseleek, surrounded by its stolons, each bearing a young plant at its tip, is sometimes called "hen and chickens." An equivalent word is "offset."

Stom'ach, an organ of digestion, present in some form in all animals above the sponges, with the exception of a few degenerated parasites. It is merely a receptacle for the food, and is provided with glands which secrete a digestive fluid. Digestion however, is carried farther and completed in the intestine and, therefore, the stomach is not the sole organ of digestion. The stomach of the human body is a sac on the left side just below the diaphragm. It has four coats: an outer, firm, serous coat; a muscular coat, with fibers arranged in longitudinal, transverse and oblique directions; a coat of loosely woven fibrous tissue; and an inner, mucous coat. The glands which secrete the gastric juice are derived from the latter coat. There are two varieties, those nearer the heart, called cardiac glands, and those at the other end of the stomach where the intestine is joined, called the pyloric glands. The latter are the more important. The stomach is under control of the nervous system, both as to its movements and as to the secretion of gastric juice. When food is introduced into the stomach, the secretion of gastric juice is stimulated through the nervous system. The gastric juice contains a ferment called pepsin, which acts especially on proteids like lean meat, white of eggs, gluten of bread etc. This action takes place in the presence of acid, and in the glands are certain cells which provide hydrochloric acid in small amount. When this is deficient, grave stomach disorders arise. The food is reduced to a condition called chyme and is passed on into the intestine. The object of digestion is to render food soluble that it may pass by absorption through the walls of the stomach and intestine. This is not a process depending upon life, as it can be performed with artificial gastric juice outside the body. The characteristic action of the gastric juice is upon proteids, while the pancreatic juice, which is introduced into the intestine, is a universal digester, of greater efficiency than the gastric juice. It aids in the digestion of starches and fats as well as in completing that of the proteids.

Stomata (*stŏm'ȧ-tȧ*) (in plants). Narrow openings are developed in the epidermis of all aërial parts of plants which require and emit gases. (See AËRATION.) Gaseous exchanges especially abound in green tissues; hence stomata are chiefly displayed by the foliage-leaves of the higher plants. Each stoma consists of two specially organized epidermal cells, called guard-cells, which are crescentic in surface-view and, being in contact by their concave faces, leave a lens-shaped opening between them. This opening leads into the system of intercellular passageways among the working-cells, and thus provides for a free exchange of gaseous substances between the working-cells and the outside air. The guard-cells change form with the varying amounts of moisture in the air, and so regulate the size of the opening between them. Stomata have been called "automatic gateways" on account of this peculiar power of the guard-cells. See LEAF and TRANSPIRATION.



STOMATA AND LEAF

Stone-Age is a term used to designate a stage of culture in man's development, not a chronological period in geological history. It refers to the period among any people when the use of metals is unknown or, if known at all, does not involve the knowledge of smelting. At such a time stone is largely used in making implements and tools, though other materials, as wood, bone and shell are also employed. The stone age is known to have existed in Europe many hundreds of years ago; in North America it continued among the Indians until the 18th century; in some other places it probably exists at the present time.

The great mass of evidence for the stone age has been gathered in western Europe, and that period has been subdivided into the paleolithic (old-stone) and neolithic (new-stone) eras. During the earlier time the implements were rudely chipped and left rough and irregular; in the later time they were often highly polished and finished with great care. Paleolithic man is thought to have existed in southern Europe while much of the continent was covered with ice. His presence there is known by the chipped flints found in place in beds of gravel and loess of France, which Prestwick and Lyell identify as drift-formations from the early ice invasion. Neolithic implements, specimens of which are much more numerous, have been collected in the oldest lake-dwellings of Switzerland and especially in Denmark. They are nowhere associated with river gravels, nor have paleolithic remains been found in Denmark. In that country the polished stone-implements and bits of pottery found in the shell-heaps of *kjökken-möddings* (kitchen-middens) indicate that man had reached a higher stage of culture by the time he had reached that region in his northward migration after the retreating ice-sheet. In America the same subdivision of periods has been attempted, but thus far the evidence seems to show the presence of neolithic man only. The specimens brought forward to prove the presence of paleolithic man seem to be rude "rejects" thrown aside before completion.

Stone-Circles or **Standing-Stones** are groups of stones, sometimes two or three standing alone and sometimes arranged in circles, found in Britain, Scandinavia, France and elsewhere. They were called druidical circles in Britain, cromlechs in France and dom-rings in Scandinavia. Sometimes they are bowlders rolled into place, and sometimes pillar-stones, fastened in position by smaller ones at the base. Sometimes there is a single circle, and again there will be one or two smaller circles within. Examination of these circles in Scotland proves that they were cemeteries of the bronze age. The largest stone-circle in Scotland is that of Stennis, Orkney. It is surrounded by a trench 30 feet wide and six feet deep, inclosing two and a half acres. There are 13 stones still standing, the highest being 14 feet.

Stone'henge is a circle of stones on Salisbury Plain, England, and was classed as one of the four wonders of England. It is a set of circles and oval figures. The first circle has pillars of stone about 13 feet high and four feet apart, and stones placed across on top. There are about 140 stones of the different circles, some being 23 feet high. It is also found to be a burial-place. The stone circles of Norway and Sweden seem to be burial-places of the iron age. The circles are rare south of the Baltic, there being only a few in France and Algeria. Consult Fergusson's *Rude Stone Monuments*.

Stone, Lucy (Blackwell), American reformer and advocate of woman's rights, was born at West Brookfield, Mass., Aug. 13, 1818, and died at Dorchester, Mass., Oct. 18, 1893. Graduating at Oberlin College in 1847, she devoted herself to advocacy of woman-suffrage and to antislavery, for which she became a zealous worker. She lectured widely in favor of woman-suffrage, organizing wherever she went local societies of the Woman's Suffrage Association, of which she was one of the founders as well as editor of the (Boston) *Woman's Journal*, its mouthpiece. She aided in organizing, in 1850, the first national woman's rights convention at Worcester, Mass., and was always zealous in the cause she held dear to her heart. In 1855 she married Henry B. Blackwell, though stipulating to bear her maiden name.

Stones, Precious, are mineral substances used in jewelry and for other ornamental purposes. They are called precious because of their rarity and expensiveness. The diamond, ruby, sapphire, oriental amethyst and emerald stand first in the list of precious stones, because of their brilliant color, luster, hardness, durability and rarity. The topaz, garnet, turquoise, tourmaline, opal, agate, jasper and onyx are of the second class, while there is still a large class of stones used for ornaments, as *lapis-lazuli*, malachite and the moonstone, which are not called precious stones. There also are two substances, derived from animals, used in jewelry: pearls and corals; and also amber, which is a fossil resin. The cutting and polishing of precious stones are necessary to bring out the sparkle and luster so highly valued. When the sparkle is desired, the stone is cut with many faces or facets, as in the diamond, but when the color is important, it is cut with a smooth and usually rounded surface. The hardness of the stone adds to its value, as it admits of a higher polish, retains it longer and wears better. The diamond is the hardest of the precious stones. The great value of these stones has led to many efforts to produce artificial imitations but without success. The usual imitations are made of a soft flint-glass, called stress or paste, which is colored and sometimes has thin plates of the real stone over or under it. See DIAMOND, PEARL and SAPPHIRE.

Stoneworts (*wûrtz*), the common name of species of *Characeæ* (*q. v.*)

Stony Point, a rocky point on Hudson River, 42 miles north of New York. There was a fort here, and one on the point opposite, during the Revolutionary War, which were captured by the British, but the Stony Point fort was retaken by Anthony Wayne in a bold night attack, July 16, 1779.

Stor'age-Bat'tery, a form of voltaic battery in which the energy, when once used, may be replaced by a process known as charging.

Like almost every other form of voltaic cell, the storage-cell consists of two conductors of the first class and one of the second class. In this case the conductors of the first class are *lead* and *lead-peroxide*, while the conductor of the second class is a solution of sulphuric acid.

This form of voltaic cell was devised in 1860 by Planté, a Frenchman. He started with two lead plates in sulphuric acid. By passing an electric current from one of these plates through the acid to the other, he succeeded in oxidizing the anode, while the cathode remained metallic lead. By frequently changing the direction of the current passed through the cell the lead-plates were rendered porous and spongy and made to present a large surface. This process is known as forming the plates. Finally a current is passed through the cell in one direction until one plate is thoroughly oxidized, while the other remains spongy, metallic lead. This process is known as charging the cell.

The charging simply restores the oxygen to the positive plate and removes the oxygen from the negative plate. Voltaic cells are divided into two classes according as they require charging or not. Those which require charging are called *secondary* cells; while cells of the Daniell or Bunsen type, which are made up once for all and continue to work until one of the electrolytes or one of the electrodes is exhausted, are called *primary*.

In 1881 Faure devised a process of putting a paste of red lead (lead-peroxide) on the positive plate and shortening the process of forming. But in the very best cells of recent years there has been a partial return to the process of Planté. When a storage-cell is being used, the current *in the cell* flows from the spongy bed-plate to the plate which is covered with lead-peroxide (Pbo_2). The result is that the former is oxidized and the latter reduced from lead-peroxide to lead-oxide. When all the peroxide is used, the cell must be charged again.

From the preceding it is evident that what is stored up in this cell is chemical energy, and not electricity, as is sometimes popularly supposed. The great merit of its storage-cell is its high electrical pressure, more than two volts, combined with a very low internal resistance. This low resistance permits the use of enormous currents without wasting much energy inside the cell.

Storage-cells are used for an endless variety of purposes; but their principal use may be reckoned as that of a "booster" in helping the dynamo during the busy hours at the electric-light station and the street-railway power-house. Many tons of storage-cells are employed also in driving automobiles and small launches. Storage-cells are often called accumulators.

Stork, a large, heron-like bird with bill much longer than the head and very stout at the base. The common migratory stork of Europe is the best-known member of the family. It is a friendly bird, nesting on housetops, old chimneys and steeples, as well as on tall trees, and is regarded as a bird of good omen. It breeds in Holland and Germany, but not in France, Italy or Russia. It is about three and one half feet long, white, except the wings which are partly black. In the autumn these birds gather in large flocks and migrate to Africa, where they spend the winter. They frequent marshy places and feed on frogs, fishes, snakes, slugs, young mammals and insects. There are about 20 species in tropical and temperate parts of the world. There is only one form that breeds in North America, the wood-ibis, which is about the length of the European stork. It is mainly white, with glossy black on the wings and tail. The head and upper part of the neck have no feathers and are of a dusky color. It breeds as far north as the southern limit of Illinois, and is an occasional summer-visitor farther north. See ADJUTANT-BIRD.

STORK

Storm, a violent disturbance of the weather, especially as regards wind and rain. By simultaneous observations of the barometer it has been found that the atmosphere of the earth is made of regions of high and regions of low pressure or, as they are called by meteorologists, anticyclones and cyclones respectively. It is the cyclones or regions of low pressure, rotating in the northern hemisphere in a direction contrary to the hands of a watch, that constitute most of our storms. In the United States these cyclones originate mostly in the region west and northwest of the Mississippi — between the Rocky Mountains and the Mississippi River or in the region about the Gulf of Mexico. Many of the storms of the Atlantic originate about the Gulf of St. Lawrence; while the storms of Great Britain take their rise mostly in the mid-Atlantic. From knowing the general trend and rate of motion of these cyclones and studying

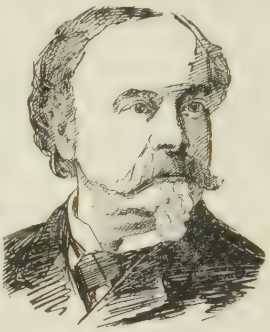
the latest telegraphic reports the weather-forecaster is able to predict all large storms with admirable and increasing accuracy. Thus the usual storm-track in the United States is to the east and over the Great Lakes to the Gulf of St. Lawrence. There is a great variety of local storms, as the *typhoon* of the China Sea and the waters about the Philippine Islands, the wind-storms of Arabia, the *blizzards* or heavy snow-storms accompanied by driving winds, tornadoes etc. The entire subject of storms must, however, be yet considered as an imperfectly understood department of the imperfectly developed but highly important science of meteorology. See CYCLONE.

Storrs, Richard Salter, an American clergyman, was born at Braintree, Mass., Aug. 21, 1821. He studied at Amherst College and Andover Theological Seminary. He was pastor of the Church of the Pilgrims, Brooklyn, N. Y., 1846-99, having had one of the longest pastorates in the city. For a number of years he was one of the editors of *The New York Independent*, and was president of the American Board of Missions. He was noted for his eloquence and beautiful style in the pulpit and his aptness and readiness in occasional addresses, and ranked as one of the first pulpit-orators in America. His more important publications include a work on *The Divine Origin of Christianity*, *The Puritan Spirit*, *Bernard of Clairvaux* and *Forty Years of Pastoral Life*. He died on June 5, 1900.

RICHARD S. STORRS

Sto'ry, Joseph, an American jurist, was born at Marblehead, Mass., Sept. 18, 1779. He was a graduate of Harvard. He was in the legislature in 1805, and in 1808 entered Congress. He was made a judge in the supreme court of the United States in 1811, holding the position for 34 years. In 1829 he became a professor in Harvard Law-School. He was an authority on all legal questions in the United States, his *Commentaries on the Constitution of the United States*, *The Conflict of Laws* and *Equity Jurisprudence* being very valuable. He died at Cambridge, Mass., Sept 10, 1845. See *Life* by his son.

Story, William Wetmore, American sculptor and poet, was born at Salem, Mass., Feb. 19, 1819, son of Joseph Story, and after graduating at Harvard studied law and was admitted to the bar. Among his works as a lawyer are *Reports of Cases*, *Treatise on the Law of Contracts*, *The Law of Sale of Personal Property* with *The Life of Story*. In 1848 he abandoned law for sculpture, and to assist him in his study of fine models he removed to Rome, Italy, where he afterwards chiefly resided, until his death at Vallombrosa on Oct. 7, 1895. His allegorical statues of *Cleopatra*, *Medea*, *The African Sibyl* and *Semiramis;* statues of George Peabody, Edward Everett and Francis Scott Key; and busts of Lowell, Bryant, Theodore Parker, Josiah Quincy and his father represent the bulk of his achievement in art. In literature he published poems, essays and rambles in Italy. The chief of these works which show his culture and sympathies are *Roba di Roma*, *Conversations in a Studio*, *The Castle of St. Angelo and the Evil Eye*, *Poems*, *Excursions in Art and Letters* and *A Poet's Portfolio*. He died in 1895.



W. W. STORY

Stowe, Harriet Beecher, an American writer, was born at Litchfield, Conn., June 14, 1811. She belonged to the celebrated Beecher family, being the daughter of Dr. Lyman Beecher and the sister of Henry Ward Beecher. She was noted as a child for her fondness for writing, and at 12 astonished her teachers with a composition on the question: *Can the immortality of the soul be proved by the light of nature?* Moving to Cincinnati with her father's family, she there married Calvin E. Stowe, then a professor in Lane Theological Seminary. In that region and through the servants employed in her own family she learned much of the evils of slavery. Her husband's connection with many prominent abolitionists; his knowledge of the workings of "the underground railroad;" a pro-slavery riot in the city, when many of the intended victims were concealed and fed by herself and her friends; a sojourn of a brother in the south; and his observations on the slave-trade all helped to fit her for her work. Her first published volume was made up of sketches written for the papers and periodicals of the day, and was called

HARRIET BEECHER STOWE

The Mayflower. In 1850 her husband became a professor in Bowdoin College, Brunswick, Me., and there the great American novel of *Uncle Tom's Cabin* was written. The characters were, many of them, taken from life, and many incidents were obtained from her brother's journal of his southern tour, and others from the lips of fugitives from slavery. The story appeared first as a serial in *The National Era* at Washington, D. C., and made a great sensation, bringing the author unexpected fame and undreamed-of financial returns. It was translated into many foreign languages, including Russian, Polish, Wendish, Armenian, Arabic, Chinese and Japanese, and has been brought out on the stage repeatedly. More than a million copies, probably, have been printed in the English language. Besides its power as a story the book had a strong influence in bringing about the Civil War, as it opened the eyes of the people to the evils of the system of slavery. Other works of Mrs. Stowe's are *Dred*, *The Minister's Wooing*, *Agnes of Sorrento*, *Oldtown Folks* and *My Wife and I*. She died at Hartford, Conn., on July 1, 1896.

Strachan, J., was born in Aberdeen, Scotland, in 1778 and educated at its grammar school there. He graduated at Aberdeen University, studied theology at St. Andrews University and came to Canada in 1799 to assume the principalship of a university which Governor Simcoe hoped to establish in Toronto. The plan fell through temporarily, and Dr. Strachan opened a school in Kingston and continued it for three years. He afterwards opened a school in Cornwall. In 1812 he was appointed rector of York, in 1818 given a seat in the executive council, in 1825 appointed archdeacon of York, and in 1839 was created bishop of Toronto. In 1840 he resigned from the legislative council. The province owes him a great debt. Through his energy Trinity College was given to Toronto.

Stradivari (*strä dē-vä'rē*) or **Stradivarius, Antonio,** a celebrated Italian violin-maker, was born at Cremona in 1644. Besides violins, he made viols, guitars and mandolins. His instruments are known for their finish and fine tone. He was the first to finish them neatly on the inside. The great care with which he selected and cut his wood, the study he gave to the shape and proportions and the luster of the varnish used combined to make an instrument without a rival. They are carefully preserved by those possessing them, and bring great prices, ranging from $1,000 to $3,000. Stradivari died at Cremona, Dec. 17, 1737.

Straf'ford, Thomas Wentworth, Earl of, an English statesman, was born at London, April 13, 1593. He entered Parliament in 1614. In the struggle with Charles I he sided with the opposition, against "not the king, but his evil ministers." In 1628 he was made president of the Council of the North by Charles I and in 1652 governor of Ireland. There is much difference of opinion as to his administration. His aim was to make the king absolute in Ireland, and his system, called "thorough" by himself and Laud, was severe. But he brought the country into a prosperity unknown before or since. He raised the revenue, improved the army, cleared the seas of pirates and introduced the cultivation of flax, which still is the most important industry of Ireland. In 1639 he became the king's principal adviser. When the Long Parliament met in November, 1640, he was charged with high treason and imprisoned. His guilt was not proved, the principal charge being his telling the king: "You have an army in Ireland that can reduce this kingdom," to which only one witness testified. But he was convicted as a man dangerous to the public liberties, and Charles gave his consent to the execution, not daring to refuse the popular clamor. He was executed on May 12, 1641. See *Life* by Foster in Eminent British Statesmen and Elizabeth Cooper.

Straits Settlements. See MALAKKA.

Strakosch (*strä'kosh*), **Clara Louise (Kellogg),** American operatic singer, was born at Sumterville, S. C., July 12, 1842, and received her musical education at New York, where she made her début at the Academy of Music in 1861. Pursuing her studies, she appeared in the season of 1864–5 as Marguerite in Gounod's *Faust*, as well as in *La Somnambula*, *Lucia di Lammermoor* and other operas, achieving great success. In 1867 she appeared also in England, where the wide range and perfection of her soprano voice attracted attention. Later on she organized an English-opera company, and with it appeared in the chief cities of this country and of Europe. Of recent years, after her marriage to Mr. Strakosch, she has appeared chiefly at concerts. Her repertoire once embraced about 40 operas.

Strass'burg, a city of Germany and, since 1871, the capital of Alsace-Lorraine, is on Ill River, two miles from the Rhine. It has been strongly fortified by the Germans, who rebuilt the citadel, dating back to 1682, and placed 14 forts on the surrounding heights. The finest building in the city is the cathedral founded in the 11th century but not finished until the 15th. It is one of the finest Gothic churches in the world, with a spire of open-stone work 466 feet high, a magnificent rose-window 42 feet across, and in the minster the wonderful clock (see CLOCK). Other fine buildings are the Protestant Church of St. Thomas, the palace, the library, the arsenal and the new university. The uni-

versity was founded in 1621, and became famous, especially in medicine and the study of the languages, but was broken up during the French Revolution. In 1819 it was established again by the union of two academies, founded in 1803 and 1808. In 1872 it was reorganized as a German university, with new buildings, laboratories, a library of over 700,000 volumes, in place of the old one of 200,000 volumes which was entirely destroyed in the siege of 1870, a faculty of 151, and an attendance of 1,418 students in philosophy, jurisprudence, theology and medicine. As Strassburg stands near the borders of France, Germany and Switzerland, it has a large trade and a great variety of manufactures, including tanneries, foundries, chemical and locomotive works, piano and tobacco factories and many jewelry establishments.

Strassburg was colonized by the Romans during the reign of Augustus, and Julian here won a victory over the Alemanni in 357 A. D. It became a free town of the Holy Roman empire in the 13th century. In 1681 it was seized by the French and confirmed to them by the treaty of Ryswick. In 1870, after a siege of seven weeks, Strassburg surrendered to the Germans on Sept. 28. Population 167,678.

Strat'ford, Can., county-seat of Perth County, Ont., has a population of 9,959, and is a railway and industrial center of growing importance, surrounded by rich farming-land.

Stratford-on-Avon, a town in Warwickshire, England, 22 miles southeast of Birmingham, celebrated as the birthplace of Shakespeare. It stands on Avon River. "Shakespeare's house," where the poet was born, is on Henley Street, and belongs to the government, having been bought for $15,000 and restored. The old guild-hall was restored in 1892, and is occupied by the grammar-school of King Edward VI, where Shakespeare was educated. The old church, with Shakespeare's and Anne Hathaway's grave, also contains an American stained-glass window representing the "Seven Ages." The Shakespeare fountain was presented by George W. Childs, an American, in 1887; and Shakespeare Memorial Theater was built in 1877–9. Anne Hathaway's cottage, near by, also belongs to the nation. Stratford-on-Avon is an important agricultural center, but its prosperity depends largely on the visitors, who number 20,000 or more every year. Population 8,318. See *Sketch-Book* by Irving; *Our Old Home* by Hawthorne; *Stratford-on-Avon* by Lee.

Stratford de Red'cliffe (Sir Stratford Canning), an English diplomatist, was born at London, Nov. 4, 1786. He in 1812 negotiated the treaty between Russia and Turkey, which released the Russian army of the Danube in time to attack Napoleon on his retreat from Moscow. He was minister to the United States during 1819–23. In 1825 he was again sent to Constantinople; again, in 1831, on a mission to draw the boundaries of the new kingdom of Greece; and once more, from 1842 to 1858, he was ambassador at Constantinople. Here his influence was so great as to gain him the name of *The Great Elchi*. He induced the sultan to begin a series of reforms, which improved the condition of the native Christians, and made every effort to prevent the Crimean War. He retired from public service at its close and died on Aug. 14, 1880. See *Life* by Stanley Lane-Poole.

Strathco'na and Mount Royal, Lord, formerly known as Sir Donald A. Smith, high commissioner for Canada at London, was born in Scotland in 1820. He early in life entered the service of the Hudson Bay Company, and was the last resident-governor of that fur-trading corporation. For a time he represented Selkirk, Manitoba, in the Dominion Parliament and was a director of the Canadian Pacific Railroad Company. In the Boer War he raised the Strathcona Horse for service in South Africa, equipping 500 men at his own expense. He is known for his active philanthropy.

Straus (*strous*), **Oscar Solomon,** an American merchant and diplomat, was born at Otterberg, Bavaria, in 1850. In 1854 his family emigrated to the United States. Lazarus Straus, the father, and Oscar made wholesale importations of pottery and glassware. Mr. Straus was educated at Columbia University. In 1887 he became minister to Turkey; returned home in 1889; and was re-appointed in 1897. Since 1902 he has been a member of the Court of Arbitration at The Hague. In 1907 he was appointed secretary of Commerce and Labor. He is the author of *The Origin of the Republican Form of Government in the United States; Roger Williams the Pioneer of Religious Liberty; The Development of Religious Liberty in the United States;* and *Reform in the Consular Service.*

Strauss, David Friedrich, a German writer, was born at Württemberg, Jan. 27, 1808. He began life as a country pastor, but after a year became professor in a seminary, and then went to Berlin for study. While teaching and lecturing at Tübingen, he published his *Life of Jesus* (1835), which aroused great excitement throughout Germany and resulted in his dismissal from his position. His next publications were defenses of his work, which were followed by his second great work: *Christian Doctrine of Belief.* He published lives of Schubart and Ulrich von Hütten, brilliant lectures on Voltaire and a new *Life of Jesus* (1864). *The Christ of Faith*

and *The Old and the New Faith* are his latest works. His style of writing places him very high among German writers. He died on Feb. 8, 1874. See *Life* by Zeller.

Strauss, Johann, Austrian dance-music composer and conductor, known familiarly as The Waltz-King, was born at Vienna, Oct. 25, 1825, and died there on June 3, 1899. He came of an eminently musical family, his father being a noted musician, while two of his brothers were composers of dance-music. On his father's death he became conductor, and toured the world with his own and his late father's orchestra. At the same time, from an early age, he composed waltzes and operettas, which have held the stage with great favor. In 1872 he conducted an orchestra of 1,000 performers at the Boston Peace Jubilee; he for a time also was musical director to Emperor Joseph at Vienna. His most famous waltz-pieces are *Wiener Blut*, *Künsterleben* and *An der schönen blauen Donau*. Of his operettas the following are best-known: *Indigo Cagliostro*, *La Tsigane*, *Die Fledermaus* (The Bat), *Der Lustige Krieg* (The Merry War), *Simplicius*, *Eine Nacht in Venedig* and *The Gypsy Baron*.

Strauss, Richard (1864–), a distinguished German composer and conductor, born at Munich, his father being the finest horn-player of his day. By musical critics Richard Strauss is variedly estimated, some esteeming his work but cacophony, while others recognize it as "the music of the future" and deem him the most eminent of living German musicians. In like manner, his *Domestic Symphony*, *Heldenleben* and other tone-poems have provoked the most acrimonious discussion; but much the same, it will be recalled, was said of Wagner and his work, and hence the balance must be struck midway between the two varied estimates current in regard to the author's productions and their effect on the ear of the listener and critic. In his earliest years Strauss was musical director at Meiningen, chapel-master twice at Munich, then at Berlin; and afterwards he occupied himself as a composer, and that of the ultra-modern school. His chief symphonic works include *Italia* (a fantasy), *Don Juan*, *Macbeth*, *Death and Apotheosis*, *Don Quixote*, *Thus Spake Zarathustra* and *A Hero's Life*. He has also published many songs (not far short of 50), and almost all have been very popular. Great successes also have been his operas of *Guntram*, *Feuersnot* and *Salome* (*q. v.*), adapted from Oscar Wilde's text, which reveal special gifts as an imaginative and daringly original composer. In 1905 Strauss paid a professional visit to this country, where he conducted many of his more admired compositions.

Straw is the stem of grasses, as wheat, oats and barley It is used on farms for feeding and for bedding animals. Its chief use in the arts is in making paper and hats. Wheat-straw is most used for plaiting, the process by which the straw is prepared for hats, bonnets and baskets. The straw is usually split into strips and plaited or braided by women and children. They are sold by the score or 20 yards in a piece. The finest straw-plaits are made in Tuscany, and are made from whole wheat. The wheat is sown very thickly and the crop pulled up and cut off by hand for threshing. The plaiting of the finer straws is so trying to the eyes that the plaiters cannot work more than two hours a day. Large quantities of straw-plait are also sent out from Canton, China. The straw-braids which are brought to this country are made into hats and bonnets by a machine which sews a hundred a day, and are pressed by another machine at the rate of four a minute. Panama hats are made from straw from the leaves of a palm, and are braided by the Indians in South America.

Straw'berry, species of *Fragaria*, a genus of the rose family. It contains about 12 species, which are found in the temperate regions of the northern and southern hemispheres. The fruit really is a much enlarged and fleshy receptacle, in the surface of which the very small, seed-like akenes are more or less imbedded. The strawberry is comparatively recent in cultivation, and in America it is said to be the most important of the small fruits. The ordinary commercial varieties are all from the Chilean strawberry (*F. Chiloensis*), whose name indicates its origin. The common, wild strawberry of the eastern United States was once extensively cultivated, but it has about passed into disuse.

Strea'tor, Ill., a city of La Salle County, on the Vermilion River, the center of a productive agricultural and coal-mining district, 92 miles southwest of Chicago. It is served by the Chicago and Alton; Wabash; Chicago, Burlington and Quincy; Atchison, Topeka and Santa Fé; and Chicago, Indiana and Southern railways. Its industrial establishments embrace foundries and machine-shops; flour and planing mills; brick, tile and sewer-pipe works; and manufactories of flint and Bohemian ware, window and rolled plate glass and locomotive-repair shops etc. The city has fine churches, schools, banks, libraries, a hospital, a home for the aged, a Y. M. C. A. building, opera-house and other civic institutions. Population 15,711.

Street-Railways. See ELECTRIC RAILWAYS.

Strength of Mate'rials, the resistance which materials offer to changes in form, such as elongations, compression, bending and twisting. Such changes in form are called strains, and the force with which the material resists a strain is called a stress.

nificent granite quay are on the island called the Town; the Knight's island, west of the Town, is occupied by public buildings, as the houses of parliament, the old Franciscan church in which many of the kings of Sweden have been buried, and the chief law-courts. In Norrmalm, a district north of these islands, are the national museum with very valuable collections of antiquities, coins and paintings, the academy of fine arts, Hop Garden with a statue of Linnæus, the Royal Library of 250,000 volumes and an observatory. Ship Island, lying east of the Town island, is the headquarters of the Swedish navy, and still farther east is the beautiful island of the zoölogical gardens. The islands are connected with each other and the mainland by bridges, and small steamers ply rapidly between them. The islands and channels make Stockholm the Venice of the north. Though the harbors are closed for three or four months every winter, there is a large trade, with considerable manufacturing of sugar, tobacco, silks, ribbons, candles, linen, cotton and leather. Stockholm was founded by Birger Jarl in 1255, besieged by the Danes in 1389, and captured by Christian II. of Denmark in 1520, when a terrible massacre followed, known as "the bloodbath of Stockholm." The city contains 332,738 inhabitants, the mass of whom are Scandinavians and Protestants and adhere to the Lutheran church. There are a state faculty of medicine with 273 students and a private philosophical faculty. Public elementary education is free and compulsory, and all children not attending the public schools must furnish proofs of having been privately educated. See SWEDEN.

Stock'port, a city in England, 37 miles east of Liverpool. It is built on the slopes of a deep ravine where two small rivers unite to form the Mersey, which is here crossed by a railroad viaduct, 111 feet high and 1,875 feet long. There are a 14th-century church, rebuilt in 1817, market-hall, free library, museum and St. Peter's square, with a statue of Richard Cobden. Stockport was the site first of a Roman station, then of a Norman castle, which was taken by Prince Rupert in 1644. It is an important seat of the cotton-industry, and has grown rapidly in spite of riots and strikes and the cotton-famine of 1861–4. There also are iron and brass foundries, engine and machine shops. Population 99,646.

Stock'-Raising. One of the most important industries in the United States; closely associated with agriculture, though some stock is yet sent to market directly from the western pasture-lands. East of the Alleghenies not much stock is raised for market, but large herds of dairy-cattle are found, while every farm has a few horses, hogs, sheep and cows to supply home needs. The Mississippi Valley and the western plains produce vast wealth in stock every year.

In America the pig has been coëxtensive with Indian corn, the greatest of food-crops. Consequently Chester County, Pa., developed the first truly American breed of swine, the Chester White, while Miami Valley, Ohio, about 1860 produced the well-known Poland China hog. The Miami Valley then was the world's corn and hog center, Cincinnati the chief American market. As the prairie states, however, were settled, a sudden change occurred in stock-raising. Indian corn spread to the arid plains, the bison disappeared and the steer and the hog followed corn to the boundary of cultivation. Then the ox went alone across "the Great American Desert" to the Rockies, and from 1870 to 1890 countless herds of cattle grazed from the Rio Grande to Canada. By 1900, however, the settlement even of "the far west" had ended this free ranging. Now the range-business is confined to producing feeders and shipping them eastward to be fattened in the corn-belt of Iowa and Illinois. The ruined grazing-lands of the southwest are being restocked with native grasses, and in Montana, North Dakota and South Dakota horses are raised on the prairie-pastures as extensively as cattle and sheep once were.

So American stock-raising has developed into the most gigantic live-stock industry ever known. The grass-lands of the far west and the corn-belt of the central west complement each other, each supplying what the other lacks. Land unfit for cultivation, where grass is cheap but corn and shelter wanting, is utilized for producing cattle and sheep. Breeding-herds that supply superior sires and dams are raised in the corn-belt, and this is the finishing or fattening ground for the stock from the western ranches. So Chicago, Omaha and Kansas City have become the markets for this immense industry. (See STOCK-YARDS). The prairie-pastures can, indeed, fatten sheep, finish many kinds of horses or even put fairly-good cattle into the market; but the cost of shipping live-stock from the range to the finishing ground is so great that live-stock must both be produced and finished at each place. Consequently farmers are breeding their own stock and developing it as part of the system of enriching their land. The meat-supply of the United States must henceforth be raised on the American farm; and live-stock is accompanied by leguminous crops (which animals alone can eat), which are the only feasible means of cheaply maintaining the nitrogen-supply and fertility of the soil. Hence stock-raising will play a larger and ever larger part in American farming.

The vastness of the live-stock industry in the United States is shown by the following statistics of domestic animals in 1907: Cattle (cows, bulls etc.) 72,533,996; horses and colts 19,746,583; mules 3,816,692; asses and burros 110,012; sheep 53,240,282; swine 54,794,439; and goats 1,948,952. See AGRICULTURE (*Stock-Breeding* and *Stock-Feeding*, p. 31); CATTLE; HOG; HORSE; MEAT-PACKING; MILK; MULE; SHEEP; SWINE; and WOOL.

Stocks are the rights in the property of a corporation which those persons possess who have contributed to its capital. Each corporation has a certain capital-stock which may be raised for the purposes of its business but need not be fully paid up. This amount is divided into shares. Certificates are made out for these shares, say $100 shares or $10 shares as the case may be. These certificates are sent to those who have paid up the capital, in proportion to the amount which they have paid. Thus if the stocks be at par, a man who had subscribed $1,000 to a certain stock would receive ten $100 certificates. But the business of the corporation may fall short of expectations; or it may exceed them. In the former case the value of the paper certificates will decrease; in the latter case it will increase. So a stock is rarely at par, *i. e.*, at such a mark that a hundred dollar certificate is worth exactly one hundred dollars. Stocks are liable to fluctuate in value not merely according to the value of the business which they represent, whether a mine, a railroad, a great commercial concern or what not, but according to the plentifulness or scarcity of money which is being invested.

There are many who almost gamble on the fluctuations of stocks. Some buy merely in order to sell; and it is to their interest to *bull* the stock or advance it in price. Others sell stock which perhaps they do not possess; believing that, by the time they will be compelled to hand over the stock, they will be able to buy it more cheaply than they have agreed to sell it. In the stock-market the former class are known as "bulls;" the latter as "bears." The mere manipulation of stock is undesirable. The member of the public who thinks that he can compete with the professional stockbrokers is likely to suffer heavy loss. He will do better to make a genuine investment in a stock, with the idea, not of selling, but of getting good interest on his money from the dividends which the stock pays out of the proceeds of the business which it represents. On every transaction in stock the buyer or seller pays one-eighth *per cent.* of the money which he pays or receives for the stock to a broker. The number of brokers in a stock-exchange is limited. Their seats are property, and may be inherited; but they are occasionally sold to a would-be broker. A seat in the New York Stock Exchange has sold for $88,000. See BOARD OF TRADE.

Stock'ton, Cal., county-seat of San Joaquin County, is on an arm of San Joaquin River. It has a good harbor, and the river is navigable at all seasons from San Francisco. The city is supplied with water by artesian wells. There are a convent, a state hospital and factories of ironware, woolens, flour, engines, cars, window-glass, leather, soap and carriages. The city is served by the Southern Pacific (Central Pacific), Santa Fé and Western Pacific railroads, as also by two traction-companies. Population 22,500.

Stockton, Francis Richard, American author and humorist, was born at Philadelphia, April 5, 1834, and, after graduating at the high school of that city, took to journalism as a profession and to contributing to the magazines. Joining the staff of *Scribner's Monthly*, he wrote much for it and *St. Nicholas*, of which he became assistant-editor. In this appeared many of his delightful stories for the young. He became a prolific and industrious author, his stories revealing quaint but unobtrusive humor, with a brightly graphic quality and a literary style that commend his work to the educated and refined. His more prominent works embrace *Rudder Grange*, *The Lady or the Tiger*, *Pomona's Travels*, *The Casting Away of Mrs. Leeks and Mrs. Aleshine*, *The Dusantes*, *The Great Stone of Sardis*, *A Bicycle of Cathay* and *The Captain's Toll-Gate*. He died on April 20, 1902.

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Stockton, Robert Field, an American naval officer, was born at Princeton, N. J., in 1795. He entered the navy in 1811, went to Africa in 1821, and helped to secure the republic of Liberia for the American Colonization Society. He was sent to the West Indies against the pirates and served in the Mediterranean. In 1845 he was sent to the Pacific coast, and next year, with Frémont, conquered California for the United States. In 1851 he was elected United States senator. He died at Princeton, N. J., Oct. 7, 1866.

Stock-Yards. Enclosures in cities where live-stock is cared for on its way to market or at market. With the development of the central and western states arose the necessity for convenient markets for distribution and sale of the enormous production of live-stock of these regions. (See

Teachers may be willing to practice silence in class and to accept development of initiative on the part of their pupils as a very prominent aim. But until the children themselves become clear in regard to the direction in which initiative is to be exercised, they are likely themselves to be provokingly silent. What, then, are the further principal factors in proper methods of study?

Both children and college students generally recognize two main factors in study — *i. e.*, memorizing and thinking. Which should come first is the next important question to be met. Custom says: Memorizing. "Fix the facts or thoughts in memory, then reflection upon them can follow at leisure" is the common thought. But there are always more duties in life than time allows us to perform, so that reflection is habitually postponed until it is omitted. In consequence, to the great majority of persons, studying signifies mainly the stultifying work of memorizing. Suppose now, this order were inverted, and young people were taught to undertake, first, whatever thinking was expected to them in each lesson. They would then at least make sure of the more interesting part. But, more than that, thinking thoughts through, in the various ways required in good study, is the very best method of memorizing them, and psychologists recommend this method even in the case of *verbatim, memoriter* work. Conscious effort to memorize would then be largely or wholly unnecessary, because the memorizing would become a by-product of thinking instead of a substitute for it. Here is a very important fact to be taught to young people about how to study. If it were applied, there would need to be less of dull drill in school; one reason for so much of it now is that there is so little thinking. Some drill might still be necessary, but by coming after most of the thinking, the motive for it would be made plainer and it would be less wearisome.

What kinds of thinking are to be expected is the next important question. The remaining principal factors in study might well be expected to be the principal factors involved in thinking.

First of all comes the selection of what is relatively most valuable. There always is a tendency for young people to regard ideas as all on the same plane of work, and many teachers encourage rather than overcome this tendency. It is encouraged by assigning lessons by pages, and then requiring practically everything to be reproduced in class. It is encouraged, also, by allowing facts to be reproduced in the order in which they have been presented in the text, since this method emphasizes again the importance of *everything*.

To combat this tendency it is well to require pupils or students to recite by topics or points rather than by pages; to take up first what they consider the most important thought in the lesson, even though it happen to come last in the work; to suggest marginal headings and even write them into the margin if they own books. By such means the habit of watching for the main issue or issues can be inculcated.

Directly connected with this should come training in the habit of overlooking or neglecting what is relatively unimportant. A pupil who has so good a memory that he reproduces practically everything in a lesson seldom deserves praise. Such a memory merely relieves him from the necessity of thinking enough to discriminate between what is especially valuable and that which is insignificant. Some clearness as to the meaning of *thoroughness* in study is here involved. So long as young people are brought up with the idea that thoroughness means attention to *everything*, recognition of relative values will be wanting. A pupil should be now and then condemned, therefore, for paying attention to what is not worth the time. You cannot teach emphasis of some parts without presupposing neglect of others, for the two are correlatives.

The outcome of good training in these two directions should be a habit of seizing quickly on the main ideas presented and of grouping the details bearing intimately upon them around the central thoughts. That would mean organization of thought, a most valuable factor in proper study. Not only should relative values thus always be very prominent in study, but the soundness, in final value, of ideas in life should also be considered. Many persons have a profound respect for print, and willingly try to hold as valuable whatever they find in a text. But from childhood good judgment in this direction should be developed, and such attempts should be a part of a teacher's work, who is endeavoring to instruct pupils in the art of study. How often are newspaper and magazine articles, as well as whole books, unworthy of perusal! Young people must be trained, therefore, not only to judge what is relatively most valuable among a lot of ideas and facts, but what is valuable for life or lacking in such worth. In other words, they must practice judging practical worth, must be made critical to this extent, and learn to believe in their right and ability in this direction. This is nothing more than saying that children and college-students should develop independent judgment or be made self-reliant and sensible.

Intimately related to this last factor of study is the need of finding the specific bearings or relation that a given topic has for daily life. It is very common for

students to store facts for distant, future use without reference to actual life at the present time. But that attitude is certainly wrong. Knowledge cannot be judged and digested till its relation to life is seen. The standard for passing judgment on values is found in life itself. Another way of expressing this thought is to say that the student should conceive specific purposes which the ideas he is studying along a given line are likely to further. This is by no means an easy task, but it is an important one. A person who habitually reads a book or magazine article without thought of any effect it may bring about either in topics for conversation or journeys that he may take hardly has the right method of study. This does not signify that one should never read for the "mere momentary tickle" or that he should always be strictly critical. But it does signify that the purpose of ideas is found in their expression and that, unless one develop the habit of teaching what he learns to the point of its contact with life at home, on the street and elsewhere, he is like the miser in hoarding wealth without reference to its use. It is the wrong habit of mind for the student. Thus he should not only *judge the value* of thought, but should form the habit of *using it*.

Still another factor of study is the work of supplementing an author's statement. Even the best of authors fail to put most of their ideas into print, or, as Ruskin puts it, all literature — like the story of the Prodigal Son — appears practically in the form of parables, requiring much supplementing in order to be properly pictured and interpreted. The words in a minister's text in comparison with those in his sermon are perhaps as one to a thousand. The statements in any text should bear a somewhat similar ratio to the thought that they suggest in the reader's mind. Accordingly, much time should be occupied by children in school in vizualizing in greater detail and reflecting upon the scenes in geography, history and other English. To this end, questions testing mainly memory are out of place; questions involving reflection should be common, if young people are to become reflective. Again the initiative, it should be remembered, should come from the children. A very common remark from the teacher, in the treatment of text, might well be: "Do we need to stop here in order to talk over any matter?" The children should even learn to call a halt themselves at fit places and to offer the supplemental thought without even a suggestion from the teacher.

These are some of the more important factors in proper study, very briefly presented. Children in the elementary school should be acquainted with these in their application, as they should be taught the principles of arithmetic. The teacher should always bear in mind that the main part of proper study is *reflection;* is *thinking*, rather than memorizing. Some one has declared that the good reader spends at least as much time reflecting on what he reads as he does in the actual reading. That is a valuable suggestion. But if such a habit of study is to be brought about, the teacher must watch the character of her question. The vast majority of questions put by teachers to-day are out-and-out memory questions, *i. e.*, they tax memory primarily. In place of these must come thought-questions. Then when children are told to "think and think hard," as they very often are, there will be some prospect that they will understand wherein the thinking that is required of them consists. See ARITHMETIC (latter part of article). Consult the Report of the National Educational Association for 1906 and *Suggestions for Improvement of the Study-Period* by F. M. McMurry. F. M. McMURRY.

Sturgeon (*stûr'jŭn*), a large fish both of salt and of fresh water, having an elongated body and the skin provided with five rows of large, bony plates. There are about 20 species, all living in the northern hemisphere. The skeleton and skull are cartilage, and the bony plates, which are formed in the skin, cover the head. Between the larger plates are smaller ones. The snout is elongated, the mouth, upon the underside, is tube-like and without teeth. In front of it hang four barbels. Its food is plants and small fish, which are sucked

STURGEON

into the mouth. The common sturgeon is found on both sides of the Atlantic and ascends rivers to spawn. It reaches a length of eight to twelve feet on the Atlantic coast, and is larger in European seas. It ascends the Hudson to Albany, and its red flesh is jocularly called Albany beef. The shovel-nosed sturgeon and the lake-sturgeon are common in the great lakes and waters of the Mississippi valley. They do not

enter the sea. A sturgeon of the Pacific coast reaches a weight of 600 pounds, but the largest of all inhabit rivers flowing into the Caspian and Black Seas. They are known as *hurso*, and reach a length of 25 feet and a weight of nearly 3,000 pounds. The sturgeon's air-bladder is the principal source of isinglass and the roe of caviar.

Sturgeon Falls, Can., on Sturgeon River, Nipissing District, New Ontario, on the main line of the Canadian Pacific. The water-power at this point has been developed to 10,000 horse-power. The pulp and paper mills of the Imperial Paper-Mills Company are here. They employ 1,500 hands. The nickel-belt extends within a few miles of the town. A refining and reducing plant is being erected. Extensive saw-mills are here, and the fishing industry is important. Population 3,500.

Stuttgart (*stŏŏt'gärt*), a city of Germany, is the capital of Württemberg. It is about two miles from Neckar River and 127 southeast of Frankfort, and is surrounded by hills, which are covered with vineyards, gardens and beautiful houses. Near Palace Square, in the center of the city, are the old castle, belonging to the 16th century, the new palace, the theater, academy, the jubilee column (1841), a statue of Schiller and the railroad-station, which is one of the finest in Germany. There are a famous polytechnic school, a conservatory of music, a museum and art-gallery and the royal library of over 500,000 volumes, including a fine collection of 7,000 Bibles. Stuttgart has one of the largest book-trades in Germany, and manufactures beer, pianos, chemicals, chocolate and furniture. Its fairs for the sale of books, hops, cloth and horses are celebrated. It has been the capital of Württemberg since 1842. Population 249,286.

Stuyvesant (*stī've-sant*), **Peter,** the last Dutch governor of New York, was born in Holland in 1592. He was in the army in the West Indies, became governor of Curaçoa, and lost a leg in the attack on St. Martin. He was made director-general of the New Netherlands, as the country was then called, in 1646. He was conciliatory toward the Indians and just toward his subjects; but, when a convention demanded that "no new laws should be enacted but with the consent of the people," Stuyvesant commanded the separation of the assembly, saying: "We derive our authority from God and the Company, and not from a few ignorant subjects." In 1650 he helped to decide the boundaries between the Dutch and English possessions, and in 1655 took the region around the Delaware from the Swedish settlers. When the English war-ships in 1664 appeared before New Amsterdam (New York), he was obliged to yield to the will of the people and surrendered the city, the treaty being signed on Sept. 4, 1664, in Stuyvesant's house on his farm, known as the Great Bowerie, from which the Bowery in New York received its name. He lived 18 years after the surrender on his farm, where he died in August of 1612. See *History of New York* by Martha J. Lamb and *Knickerbocker's History of New York* by Washington Irving.

Style (in plants), that part of a carpel which rises from the ovary as a more or less elongated beak, and bears the stigma. It relates the stigma properly to pollination. It usually is a slender cylindrical body, but it often is much modified in form, as in the common iris or flag, in which it resembles a small petal. In case the style is lacking, the stigma is said to be sessile on the ovary. See FLOWER.

(*a*) Style.
(*b*) Stigma.

Stylites (*stī'lī'tēz*), **Simeon,** a member of a class of hermits who spent their lives on pillars (Greek *styletes*). He was the founder of the order, and lived in the beginning of the 5th century. He was a Syrian monk and spent nine years in a monastery without stirring from his cell. Then, in his desire for holiness, he ascended a pillar near Antioch, where he spent 30 years. The pillar was 72 feet high and only four feet square on the top. His fame brought crowds of pilgrims, to whom he preached, making many converts from paganism. He died on his pillar in 459, when 72 years old, and was buried with great pomp at Antioch. Other monks followed his example down to the 12th century.

Styx (*stĭks*), in Greek mythology, is one of the rivers of the lower world, around which it flows seven times. Charon ferries the souls of the dead over this stream. It is named from the nymph Styx, the daughter of Oceanus, who first came to the help of Zeus against the Titans.

Sub'marine' Nav'iga'tion. See TORPEDO.

Subsoil is the soil below the surface-material which has undergone chemical change by weathering (see SOILS) and may contain humus, making it darker than the subsoil. Subsoiling is deep plowing to bring up the lower soil that has not been exhausted by cropping. Its mineral food cannot become available until decomposed by weathering-agents (see NITROGEN-GATHERING CROPS). The weathering process goes on slowly, and land has been greatly injured by bringing up too much at once. Subsoiling should go on at the rate of about half an inch a year till a depth of nine or ten inches is reached.

Suchau (*sōō'chou'*), one of the largest cities in China, is 50 miles northwest of Shanghai, on the imperial canal. It is built on islands separated by canals. It is a center of silk-manufacture and print-

ing. It was captured in the Tai-ping rebellion, and retaken by "Chinese" Gordon in 1863, when many of its finest buildings were destroyed. Population 500,000.

Suck'er (in plants), a very strong-growing branch which arises in an unusual position, as from the older parts of trees and shrubs, often at the base, or in connection with wounds. The process known as pollarding is for the purpose of inducing the development of suckers by means of wounds. Suckers are often called watersprouts.

Sucker, the name given a number of freshwater fishes of North America, with thick, fleshy lips bordering a sucking mouth. There are about 60 species in the family, which embraces the buffalo-fishes of the Mississippi Valley, the common suckers and the mullet or red horse. They feed on plants and small water-animals. The common or white sucker reaches a length of 18 inches, and is very abundant in streams from Canada to Montana and Florida. They are eaten, but the flesh is rather tasteless and bony. The *remora* (*q. v.*), having a sucking-disk on the back of the head, is also sometimes called a sucker, and the name is also applied to the hag and certain other fishes.

Sucre (*sōō'krā*), a name for Chuquisaca, the capital of Bolivia (*q. v.*).

Sudan (*sōō-dän'*), a vast region in Africa, stretching from the Atlantic to the Red Sea and from Egypt and the Sahara almost to the equator. The Arabic name, *Beled-es-Sudan*, means Land of the Blacks. It is the home of the true negro race. Its area is estimated at 2,000,000 square miles, its population at 20,000,000. There are three divisions — eastern, western and central Sudan. Eastern Sudan is sometimes called the Egyptian Sudan, which until 1882 was a province, with Khartum for its capital. It is now divided into 13 provinces, which are subdivided into districts and include Bahr-el-Ghazal, Berber, Blue Nile, Khartum, Kordofan, Red Sea, Senaar, Upper Nile, White Nile and other provinces. (Darfur, though within Egyptian Sudan and paying tribute, has a hereditary sultan and manages its internal affairs almost independently.) The regions watered by the Nile are very fertile, yielding great crops of cotton, indigo, sugar, rice, corn and tobacco. Other parts are bare, though covered with grass in the rainy season, when they afford pasture to large flocks of camels, sheep and goats. Other products are ivory, ostrich-feathers, gums, india-rubber, iron, gold, honey and wax.

Egyptian Sudan covers 950,000 square miles, and has a population of about 2,000,000. The Egyptians for 60 years after 1819 extended their power over the regions around Khartum and even to the Wellé and to Lake Victoria, but in 1877 and 1882 the native tribes rebelled. General Gordon, sent out by the English government to the help of Egypt, was shut up in Khartum, and his mission ended in disaster. In 1896 the Anglo-Egyptian army again sought to recover the lost provinces, and after two years were successful. A convention between the British and Egyptian governments followed, in which it was agreed that they should govern Sudan jointly through a governor-general. Khartum is in railway and telegraphic communication with Cairo, and on Dec. 12, 1899, Sudan was declared open for general traffic. Western Sudan includes the valleys of the Niger, Senegal and other rivers draining into the Atlantic and the countries known as French Sudan. Central Sudan covers the valleys of the rivers that drain into Lake Tsad. Consult Schweinfurth's *Heart of Africa* and Nachtigal's *Sahara and Sudan*. See AFRICA, EGYPT, FRENCH SUDAN, NIGER RIVER, NIGERIA, NILE, SENEGAL, SOKOTO and TIMBUKTU.

Sue (*sü*), **Marie Joseph Eugene,** a French writer, was born at Paris, Dec. 10, 1804. He practiced surgery for some years in the army, in Spain and at Navarino, using his experience in his novels. *The Mysteries of Paris*, a famous novel, was his first success. It was printed in 1842, and appeared first in *The Journal of Debates*. *The Wandering Jew*, with which Sue's name is most associated, was also printed first in a newspaper, and issued afterward in ten volumes. He later wrote *Seven Capital Sins* and *Mysteries of the People*. The last work was condemned by the court at Paris as immoral and seditious. In 1850 he was elected a deputy to the assembly, but went into exile after the accession of Napoleon III and died in Savoy, Aug. 3, 1857.

Suez (*sōō-ez'*) **Canal,** a passage connecting the Mediterranean and Red Seas, was begun in April, 1859, under the French engineer, Lesseps (*q. v.*). Half the money for the great work was raised by subscription in Europe, and the other half by the khedive of Egypt. The canal was finished in 1869. It cost about $100,000,000, and is 87 miles long and originally from 150 to 300 feet wide at the top and 26 feet deep. In 1886 it was widened and deepened. The highest point cut through is not more than 50 feet above the ocean. Sidings, side-basins to allow vessels to pass each other, are built every five or six miles. Since 1887 the canal has been lighted by electric light. It costs a vessel about $500 to make the passage, and takes a little over 24 hours. In 1906, 3,975 vessels, exceeding 18 million gross tons, passed through the canal, and the number of passengers, military and civilian, was 394,253. Population of Suez, Port Said and Canal Environs 75,149.

Suf'frage is the right and act of voting, either for the election of public officers or

upon such laws as may be submitted to the people. In most countries suffrage is restricted to males above the age of 21. Other requirements that are practically universal are citizenship and a certain term of residence in the state or electorate

in which one votes. In the United States the suffrage is granted and controlled by the states, and not by the Federal government. The consequence is a diversity of requirements for the suffrage. The idea that the suffrage is one of the natural rights of man would find its logical conclusion in universal adult suffrage, such as is enjoyed in New South Wales and New Zealand; or at least in universal manhood suffrage. In most of the states of the Union, however, the suffrage is restricted by the exclusion of women, criminals, idiots, illiterates and sometimes other classes. A property qualification is now seldom required. Previous to the Civil War most of the states had adult manhood suffrage, negroes excluded. By the fifteenth amendment to the constitution the states are forbidden to abridge suffrage "on account of race, color or previous condition of servitude." Other conditions have been imposed, however, by some of the states by which negroes in those states are for the most part now disfranchised. In North Carolina and Louisiana all whose fathers and grandfathers enjoyed the suffrage in 1867 may enjoy it without regard to other qualifications. Some of the southern states have used educational tests after the fashion of Massachusetts and Connecticut, chiefly in order to disfranchise the mass of the negroes.

Suffren', Pierre Andre de, a French naval hero, was born at Saint-Cannat, July 17, 1726. He entered the navy when only 14, was captured but soon released, and served six years with the Knights of Malta. He was with the fleet blockading Gibraltar, and in command of five ships sailed to Madras, where he was in two or three battles, and conquered Trincomalee (1782). He was made vice-admiral of France on his return to Paris, where he was received with the greatest honors. He is called "one of the most dangerous enemies the English fleet has ever known, and, without exception, the most illustrious officer that has ever held command in the French navy." He died at Paris, Dec. 8, 1788. See *Studies in Naval History* by Laughton.

Sugar, the name of a great number of substances which have a certain chemical composition and are soluble in water. The sugar of commerce, however, is chiefly derived from sugar-cane and sugar-beet, the latter supplying nearly two thirds of the sugar used by the world. In these and other plants the sugar is an essential food, and is manufactured out of raw materials by green plants.

The sugar-cane (*Saccharum officinarium*) is thought to have originated in India, but it is not known wild. In the United States sugar-cane is most extensively cultivated in Louisiana, but it also is an important industry in Florida and Texas, and is cultivated to some extent in Mississippi, Alabama and Georgia. Cuba and Hawaii also are great centers of the sugar-cane industry. Sugar is extracted from cane by milling or by diffusion. The first method is more used, diffusion being confined almost wholly to sugar from beets. Mills handle from 200 to 1,400 tons of cane a day, and extract 90 to 95 per cent. of its sugar. The cane, cut or shredded before reaching the mill, is crushed, watered and crushed again. Watering the cane increased the quantity of sugar extracted by the second crushing, the increase being four or six pounds of sugar for each ton of cane. The sugar-juice extracted is next clarified and impurities removed. This is done by defecation, carbonation or superheating. Each process uses chemicals, as lime, sulphur or others; heat; settling; and filtering. Defecation consists in straining the juice through copper-wire gauze, drawing it into a tank, and, in case sulphur is used, mixing it thoroughly with sulphur dioxide. From the tank the juice is drawn into clarifiers of 2,000 to 6,000 gallons, where it is neutralized by milk of lime and heated almost to boiling. Some impurities rise, and others sink, but both are removed and the clear juice is drawn off and filtered. The liquid is then concentrated to such a density that the sugar crystallizes. This is accomplished in up-to-date factories by vacuum-appa-

ratus, — a dome-shaped receptacle of five to ten feet diameter, eight to 15 feet height and provided with steam-coils. The juice passes through three of these pans, is concentrated by steam and boiled. When grains of sugar are found, crystallization has occurred, and the rest of the process consists in making these become whatever size is wanted. This object is gained by continuing the boiling *and inserting little amounts of syrup time and again.* Finally the mixed syrup and sugar are separated in a centrifugal machine revolving 1,000 or 1,200 times a minute, which throws the molasses out, whereas the sugar stays. This sugar is "first" or "raw" sugar.

In 1907 the world's production of cane-sugar was 7,361,936 (long) tons, the United States (including Hawaii, Porto Rico and the Philippines) producing 905,000 tons, Cuba 1,427,673 and Java 1,011,546. Mauritius, Brazil, Queensland, Peru, the British West Indies, Argentina, Demerara and Haiti and Santo Domingo also produced cane-sugar, Mauritius yielding 220,000 tons, but Haiti and Santo Domingo only 60,000. The consumption of cane-sugar in the United States in 1906 was 2,557,696 tons.

The sugar-beet *(Beta vulgaris)* came from Burgundy, and is extensively cultivated in Europe. In the United States the sugar-beet industry is comparatively recent, and is most largely developed in Colorado. Cultivating this beet is extremely expensive. Harvesting begins at different times in different sections, — in California as early as August, elsewhere as late as October, — and takes two or four months. The beets are washed and sliced, and then their sugar is extracted by washing them in cells filled with hot water. The liquid sugar-solution is purified by carbonation, that is, by applying lime and carbon dioxide, bleached with sulphur dioxide, and then settled and filtered. The filtered liquid is treated like cane-sugar. Germany preëminently is the home of the beet-sugar industry. In 1907 it produced 2,238,000 (long) tons; Russia, 1,470,000; Austria 1,344,000; France 756,000; the United States only 433,010; Belgium 283,000; and Holland 181,000. Colorado produced 153,295 tons, California 79,464 and Michigan 79,189. The whole world's production of beet-sugar was 7,150,010 tons.

The sugar-trade of the world is regulated by international agreement (1902). The United States, which, with Cuba, can easily supply the American demand, have practically ceased to import sugar from Europe.

Maple-sugar is a sugar of minor commercial importance, the maple chiefly used being *A. saccharinum.* The principal centers of this industry are Vermont, New York and Ohio.

Su'liotes, a mixed race who inhabited the valley of the ancient Acheron in what now is European Turkey. They were of Greek and Albanian origin, and were descended from a number of families who fled from Turkish oppression to the mountains of Suli, whence their name. For several years they resisted the Turks, but, vanquished at last, took refuge in the Ionian islands. Though they helped in the war of Greek independence under their brave leader, Marco Bozzaris, their country was not included within Greek boundaries by the treaty of 1829 nor by the extension to that treaty of 1881, but most of them established themselves in that country. See *History of Suli and Parga,* by Perhaebos.

Sul'la, Lucius Cornelius, a Roman dictator, was born in 138 B. C. As quæstor in 107 under Marius in Africa, he induced the Mauritanian king to surrender Jugurtha, whom he brought in chains to the Roman camp. He was in the war against the Cimbri and in Cilicia, where he was sent by the senate to restore the king to his throne. On his return to Italy in 91 the rivalry between him and Marius threatened to break out openly, but was checked for a time by the Social War, in which Sulla won a brilliant success. He was given command in the second war against Mithradates, but Marius affected his expulsion from Rome, only to be in his turn driven out by Sulla. The four years he spent in the east were years of great success, in which he took Athens and won the victory of Chæronea. He crossed the Hellespont, forced Mithradates to ask for peace, landed at Brundusium and before the gates of Rome fought the great battle with the Samnites in which 50,000 men fell on each side. Sulla was now master of Rome and Italy. His dictatorship was marked by the cruel murder of his enemies. He published a list of proscribed persons whom any one might kill, and in this way got rid of his enemies, to the number of nearly three thousand. He made some changes in the government, mainly in strengthening the senate and taking the power from the people. He spent his last years at Puteoli in dissipation, bearing the marks of it in his blotched face, compared by the Greeks to a mulberry sprinkled with meal. He died in 78 B. C. The inscription on his monument, said to have been composed by himself, asserts that none of his friends ever did him a kindness, or none of his foes a wrong, without being well-repaid.

Sul'livan, Sir Arthur Seymour, an English composer, was born at London, May 13, 1842. He studied at Leipsic. He wrote *Kenilworth,* a cantata; the overtures *In Memoriam* and *Marmion* and the oratorios of *The Prodigal Son, Light of the World, Martyr of Antioch* and *The Golden Legend.* He is best known by his hymn-tunes (by *The Lost Chord* especially) and by

his songs and burlesque operas. The operas were written in connection with W. S. Gilbert and were very popular, especially *H. M. S. Pinafore*, which ran for 700 nights, and *The Mikado*. Later he wrote the opera of *Ivanhoe*. He received many honors, and in 1883 was knighted. He died on Nov. 22, 1900.

SIR ARTHUR SULLIVAN

Sulphur (*sŭl'fŭr*), one of the nonmetallic elements. It is found very widely distributed in the mineral knigdom, partly free, partly in combination with other elements. It is usually abundant in volcanic districts, large quantities coming from Sicily. It is found in many parts of the United States, but this cannot compete with that from Sicily. Free sulphur is found mixed with earthy matter or pure in the shape of crystals. In combination it is found with iron and copper as iron and copper pyrites; with lead in galena; with zinc in blende. It is also found in the form of sulphates, as the sulphates of lime and magnesia. In vegetables it exists in the proteids or albuminoids of seeds, in the oils of mustard, garlic and asafœtida and in the juices of some plants. In animals it is found in the tissues, hair, saliva etc. Sulphur is a solid, brittle, yellow substance, without taste or smell, and will not dissolve in water. When heated, it forms a thin yellow liquid; heated to boiling-point, it forms a yellow vapor. This vapor condenses into a fine powder, called flowers of sulphur. When it is melted, it is poured into molds, which make the common roll-sulphur or brimstone. When heated in the air it takes fire, burning with a blue flame, and changes into sulphurous acid with suffocating fumes. Sulphur is used in making matches and gunpowder and, as sulphurous acid, in bleaching, in the destruction of insects and the germs of disease and in the manufacture of sulphuric acid or oil of vitriol, which is a compound of sulphur, oxygen and hydrogen. Large quantities of the acid are used in preparing sodium sulphate from common salt as a preliminary step in one of the processes for making soda.

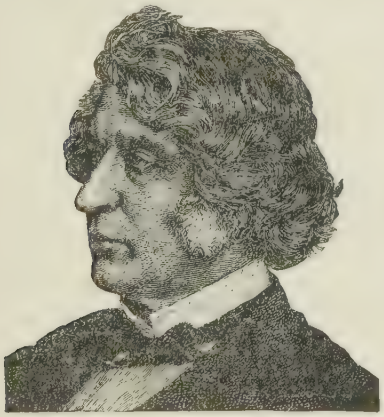
Sulu (*sōō-lōō'*) **Islands, Philippine Group,** acquired by the United States from Spain by the terms of treaty of peace, Dec. 10, 1898. The Sulu archipelago extends from the southwestern peninsula of Mindanao Island to the northeastern angle of Borneo and between the Sulu and Celebes Seas, the latter an eastern inlet of the Pacific. The larger islands are mountainous and of volcanic origin; the smaller ones are chiefly coral islets, covered with verdure. There are five chief islands, the dominant race being the Moros, speaking the Sulu tongue, which is akin to that of the Malays. The inhabitants are hardly civilized yet, and consequently piracy was common among them even under Spanish rule. The staple growths include corn, rice, coffee, chocolate, sesame, saffron, cotton and hemp. The Chinese formerly did considerable barter with the islands, exchanging opium, tobacco and general merchandise for pearl-shell, coral, sharks' fins and native cordage. Estimated population 51,400, of whom less than 1,300 were civilized in 1903.

Su'mac, species of the genus *Rhus*, which contains over 100 species, chiefly tropical. In the United States there are about ten species, some of them well-known shrubs or small trees, with leaves which show bright red to purple coloration in autumn. The common poison-oak or poison-ivy (*R. Toxicodendron*) is a sumac whose foliage is very poisonous. The most common form is *R. glabra* or smooth sumac, a shrub which often covers large and especially barren areas, with large compound leaves and dense, crimson, velvety clusters of fruit. See POISONOUS PLANTS.

Suma'tra (*soō-mä'trä*), one of the largest islands of the Indian Archipelago, lies on the equator. It is 1,115 miles long and 275 broad, and is a dependency of the Netherlands. The Chain Mountains in several ranges, from 7,000 to 10,000 feet high, cross the island, with seven or eight active volcanoes and a number of mountain lakes. There are large rivers on the western side of the island, and the forests are so thick that it is said an ape can travel across the island from tree to tree without once descending to the ground. A Dutch expedition in 1877, exploring only a small part of the western side, collected 400 varieties of timber. The animals of the eastern side differ entirely from those on the western side. The orang-outang (*q. v.*) and the bru are the most common apes. The bru is employed by the natives to gather their cocoanuts. The tiger, Malay bear, hog, two-horned Sumatran rhinoceros and elephant are among the best-known animals. The python, 15 to 20 feet long, cobra and crocodile are found; and 250 species of spiders have been discovered since 1858. Gold and coal are mined; rice, sugar, coffee, pepper, cocoanut, sago, orn and sweet potatoes are cultivated. The people are of different tribes of the Malay family. The island became known in 1508 to Europeans through a Portuguese explorer, and Portuguese trading-stations were formed on the coasts. The Dutch drove out the Portu-

guese, but did not completely occupy the coast until 1881, and large parts of the interior are still unexplored. The area is 161,612 square miles, with a population of 3,168,312. In 1832 what is known as the culture-system originated in Java and spread to the western coast of Sumatra. This meant the officially superintended work of the natives in the culture of various products; but in 1870 this system was abolished, and native labor is now required only for the production of coffee. The Europeans and those connected with them live under the laws of the mother-country, while there are separate laws for the natives. Schools are provided for Europeans, natives and orientals. Consult Alfred Russell Wallace's *Indian Archipelago.*

Sum'ner, Charles, an American statesman, was born at Boston, Mass., Jan. 6,



CHARLES SUMNER

1811. He studied at Harvard and adopted the profession of law. He edited *The American Jurist* and three volumes of law-decisions, chiefly those of Judge Story, and lectured in the law-school at Harvard. He carried his law-studies farther in Europe at the Sorbonne, and spent two or three years in travel, receiving marked attention when in England. His appearance in politics dates from July 4, 1845, when he delivered his oration on *The True Grandeur of Nations*, which denounced the use of war to decide national questions and attracted general attention both in America and Europe. He succeeded Daniel Webster in the senate of the United States in 1850, and retained his position through successive re-elections until his death. He helped to form the Free Soil party, and stood almost alone in the senate at that time in his opposition to slavery. His strong, uncompromising attacks upon slavery were bitterly resented by the south. This hostile feeling resulted in an attack upon Sumner while sitting at his desk in the senate-chamber, from the effects of which he suffered for nearly four years. His speech on *The Barbarism of Slavery*, delivered in June, 1860, was occasioned by the struggle over the admission of Kansas as a free state. As chairman of the committee on foreign relations, in March, 1861, he argued against the seizure of the Confederate commissioners in the Trent affair, and made a powerful speech on *Our Foreign Relations* and one on *Our Claims against England.* He was selected in April, 1865, to deliver the eulogy on Lincoln. His opposition to the treaty with Santo Domingo in 1869, brought him into difficulty with President Grant, and ended in his supporting Greeley for the presidency in 1872. Among his last important measures were the introducing of the civil-rights bill and of the resolution to remove the names of battles of the Civil War from the colors of the army. His publications are made up of his public addresses, and fill 15 volumes, prepared for the press partly by himself and partly by Longfellow, his literary executor. Consult *Memoirs and Letters* by Pierce and *Life* by Lester. He died at Washington, D. C., March 11, 1874.

Sumner, Edward Vose (1797–1863), American soldier, was born in Boston, Mass., and educated at Milton Academy. In 1819 he entered the army as second lieutenant, and served in the Black Hawk and Mexican Wars and took part on the frontier in campaigns against the Indians. In the early 50's he was governor of New Mexico, and later saw further Indian fighting, chiefly against the Cheyennes. In the Civil War he was given charge of the Department of the Pacific, with the rank of brigadier-general, but was subsequently transferred to the Army of the Potomac, where he served during the Peninsula and Antietam campaigns and saw severe fighting at Fair Oaks and Fredericksburg. For these services he was promoted to be major-general both in the volunteer and the regular army. Late in 1862 he was assigned to command in the Department of Missouri, but died (at Syracuse, N. Y.) ere he could reach the field of his new duties.

Sum'ter, Thomas (1734–1832), an American Revolutionary soldier, was born in Virginia. Early in his career he served under Braddock in the disastrous expedition against Fort Duquesne and took part in fighting the Cherokees. In 1776 he was appointed lieutenant-colonel of a regiment of South Carolina riflemen, and subsequently became a partisan commander, defeating the Tories in 1780 at Hanging Rock. Twice he had to accept defeat at the hands of Tarleton, the English general in command of *The British Legion*, though later he settled accounts with that general at Blackstock Hill, though himself wounded in the affair. Prior to this, and while in

command of the South Carolina troops, he had gained the rank of brigadier-general. At the close of the Revolutionary War he acted as a member of the South Carolina convention which ratified the Federal constitution, and for two periods (1789–93 and 1797–1801) was a member of the Federal house of representatives. During 1801–09 he served in the national senate, and during 1809–11 he was minister to Brazil. When he died, he was the last general officer of the Revolutionary era.

Sun, The, our nearest star and the central body of the solar system. For the inhabitants of the earth no other body in the heavens compares for an instant with the sun in interest and vital importance. For not only are the orbits of the earth and the other planets determined by the sun, but all forms of life on the earth immediately depend upon heat and light from the sun.

The distance of the sun from the earth is 92,897,000 miles, a stretch which baffles the imagination. Professor Young illustrates this quantity by saying that if a child were provided with an arm long enough to reach the sun and thus burn his hand, he would die of old age before he learned that he was burnt, assuming, as Helmholtz found, that sensations travel along the nerves at the rate of about 40 feet per second. Even light itself, traveling with the stupendous speed of 186,000 miles per second, requires 499 seconds for the trip from the sun to the earth.

The diameter of the sun is approximately 866,500 miles, a distance nearly twice as great as the diameter of the moon's orbit, while the mass is 1,332,000 times that of the earth, making its density about 1¼ times that of water and the attraction of gravitation at the surface of the sun 27 times as great as at the surface of the earth. The weight of an ordinary man at the solar surface would, therefore, be such that he could not stand erect with his present strength of muscles.

The period of rotation of the sun was first determined after Galileo had discovered spots on the solar surface; and this rotation takes place in a very remarkable manner, for Carrington found that at the sun's equator spots travel once around the sun in 25 days, while at latitude 30° the period is 26½ days, and at latitude 40° is no less than 27 days. Hence the sun rotates most rapidly near the equator and diminishes constantly in angular speed as one approaches the poles. This fact has never been satisfactorily explained.

As to the constitution of the sun and as to the nature of sun-spots there are almost as many "theories" as there are men. What is reasonably certain, however, is that practically all of the elements which have been found in the earth's crust are to be found in the sun, making it highly probable that at some time the earth split off from the sun in the manner suggested by the nebular hypothesis. Concerning the interior of the sun practically nothing is known; for its temperature is outside the range of our experiments.

The white surface of the central body of the sun is called the *photosphere*. The spectroscope shows that this photosphere is surrounded by a layer of incandescent gases which we call the *chromosphere*. Certain parts of this chromosphere appear at times to be heaped up into brilliant clouds thousands and even hundreds of thousands of miles high; these are called *prominences*. Beyond the prominences and the chromosphere is a halo of light seen only at times of eclipse. It is called the *corona*, but beyond the mere fact that it is an appendage of the sun little is known about it. The fact, however, that its spectrum contains bright lines would seem to indicate that it consists partly, at least, of a self-luminous gas.

The best account of solar phenomena is to be found in Professor Young's delightful volume, *The Sun*, published in the International Scientific Series. See ASTRONOMY and PLANETS.

Sun'bury, Penn., a borough, county-seat of Northumberland County, on Susquehanna River about 55 miles from Harrisburg. It is in a coal and lumbering region, and makes extensive coal-shipments. Its important manufacturing establishments are sash, door and nail factories, coffin and casket works, a rolling and a planing mill, silk-mills, dye-works and railroad-shops. Among its noteworthy buildings are Mary M. Packer Hospital, the county court-house and municipal buildings. East Sunbury is just across a small stream. Though the towns have separate municipal governments, they are united in their industrial interests. Sunbury was settled in 1772 and incorporated in 1797. It has the service of the Pennsylvania and Reading railways. Population 10,968.

Sun'day-Schools are schools for religious instruction, meeting on Sunday. There were schools for religious instruction in connection with the Jewish synagogues and also among the early Christians. Luther established such schools in Germany, and Knox in Scotland. But the credit of founding the modern system of Sunday-schools belongs to Robert Raikes, who in 1780, when living in Gloucester, England, gathered the children from the streets on Sunday and hired teachers for them at 25 cents a day. These schools opened at 8 A. M., lasted until the children went to church, and after the second service began again, holding until 5:30 P. M. The children were taught their letters, reading and the church-catechism. The first Sunday-school in

London was started by Rowland Hill in 1784. There are now, it is estimated, 7,000,000 scholars in the Sunday-schools of Great Britain. The first regular Sunday-school in America is thought to be the one started by Bishop Asbury in Hanover, Va., in 1786, though there had been schools for instruction on Sunday at Roxbury and Plymouth, Mass., as early as 1674 and 1680.

In 1890 the number of teachers engaged in Sunday-school work was estimated to be nearly 2,000,000, with almost 18,000,000 pupils, including all denominations.

The instruction is usually given by voluntary and unpaid teachers, a plan first adopted by the Methodists in England. The classes usually meet in the auditorium of the church represented and in any other available space in the church-building. It has been the custom for many years, also, to use a uniform series of Bible-lessons.

Quite recently the need for radical reform in the conduct ot Sunday-schools has become apparent to many. These schools, as a class, in the quality of their discipline, instruction and equipment are recognized as far inferior to the day-school. Yet religious instruction should be as well-given as arithmetic or geography, any one will admit. To bring about improvement the first requisite is a well-ventilated, properly heated and lighted room for each class, as in any good school. To this end individual churches are beginning to erect separate Sunday-school buildings, with one assembly-room and many recitation-rooms.

Next, only trained teachers are desired, who have had time, energy and interest enough to prepare themselves carefully for each Sunday's instruction. To secure these, some churches are now paying these teachers a certain sum, as in the day-school. It is a great advantage for the superintendent of a Sunday-school to bear such a business relation to his teachers. He then has some means of influencing them to improve their work, when necessary, and to attend regularly. Beyond question very many persons have been giving instruction in religion who would not be considered for a moment as fit to teach any class in our public schools. Such a condition is bound to inculcate disrespect, on the part of many, for religion in general. Deep religious interest is essential to any Sunday-school teacher's success. But in addition to such interest there should be knowledge of the Bible and knowledge of good methods of instruction. It is to be hoped that the Sunday-school will improve during the next 25 years as much as the day-school has in the last 25.

Dr. Richard Morse Hodge of Union Theological Seminary, New York City, has been an active agent in bringing about improvement in the work of the Sunday-school.

Sun'derland, a seaport of Durham, England, is at the mouth of Wear River, 13 miles northeast of the city of Durham. Among the public buildings are the town-hall, free library, museum, art-gallery, winter-garden and Victoria Hall, the scene of a terrible accident in 1883, in which 182 children were killed. There are over 70 churches, an infirmary, an orphan-asylum and several theaters and clubs. People's Park contains a monument of Havelock. There are two iron-bridges over the Wear, the older one built in 1793–6 and widened by Robert Stephenson in 1858–9. There are four large docks and five piers at the harbor. Coal and coke, bottles and glass, earthenware and lime are exported. Sunderland is noted for its 13 iron shipbuilding yards. Iron, glass, chemicals, rope, paper and lime are also manufactured. The famous Pemberton coal-pit is 380 fathoms deep, and some of the workings reach under the sea. Sunderland is known to have been a town as early as 1311. It was a small place till the beginning of the 19th century, but since then, owing to the improvement of its harbor and the growth of Durham's coal-trade, it has grown fast. Population 146,077.

Sun'fish, a common name used to designate a number of different fishes. The fresh-water sunfishes, of which there are about 25 species, abound in the Mississippi valley. They are bass-like fishes. The most common one is generally known as the pumpkin-seed. It reaches a length of eight inches and is of bright colors — greenish olive, with bluish sides spotted with orange, and the belly and lower fins orange-tinted. It is very abundant in ponds, lakes and streams of the east. In western rivers sunfishes rarely come south of the latitude of Chicago. The marine sunfish or head-fish belongs to an entirely different family. There are three species inhabiting the open sea. They are large fishes, with a very short body, and look like huge fish-heads provided with fins. They reach a weight of seven or eight hundred pounds and a length of seven or eight feet. They are not good for food, but a healing oil is derived from their livers. Their habit of basking in the sun at the surface of the water gives them their name, while that of fresh-water sunfishes is derived from their bright colors.

Sun'flower, species of *Helianthus*, a genus of the great composite family. There are many species native to the United States, but the best-known form is *H. annuus*, a common species in cultivation, distinguished by its great stature and very large heads. It is a native of the western plains. The

seeds yield a drying-oil nearly equal to that of linseed.

Supe'rior, Wis., county-seat of Douglas County, is at the head of Lake Superior, on St. Louis, Superior and Allouez Bays. It is a terminus of the Great Northern; Northern Pacific; Chicago, St. Paul, Minneapolis and Omaha; and Duluth, South Shore and Atlantic (Canadian Pacific) railways. The Wisconsin Central is entering the city and preparing terminal facilities. The city has 13 miles of water-front, with extensive ore, coal, grain, lumber and merchandise docks, and its lake-commerce amounts to 11,047,250 tons, more than the marine business of Boston or New Orleans. Superior has a perfectly land-locked harbor, and is the natural outlet for all the country west of Lake Superior as far as the Pacific. The city boasts the largest dry-dock on the Great Lakes and a great shipbuilding plant, where originated the type of boat known as the whaleback. It is the distributing point of the northwest for coal and oil. There are 60 churches, a state normal school, ten large public schools with over 6,000 pupils, two high schools, two business colleges, three parochial schools, three hospitals, a $50,000 Carnegie library, two daily and six weekly newspapers, five banks, thirty-five miles of paved streets, complete sewerage system, electric light and gas plants, an excellent filtering-system of water-works and twenty-six miles of electric street-railway. The manufactures chiefly are flour, lumber, iron, furniture, barrels, bags, coke and twine. The climate is crisp, dry and beautiful, cool in summer and relatively mild in winter. The original settlement was made at the eastern end of the city in 1853, but from 1858 to 1882 the place was practically dead. In 1882 an attempt to build a city was made four miles east on St. Louis Bay, which proved so successful that the two settlements united in 1891 and incorporated as Superior. The growth has been very rapid, the last census showing a gain of 160 per cent. Superior is the second city in Wisconsin, having a population of 40,000.

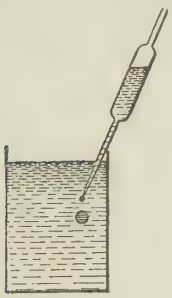
Superior, Lake, the largest body of fresh water on the globe, is the highest and most western of the great lakes. It is bordered by Michigan, Wisconsin and Minnesota in the United States and Ontario in Canada. Its greatest length is 412 miles, its greatest breadth 167; and it covers 31,200 square miles, making it a little larger than South Carolina. The surface is $601\frac{8}{10}$ feet above sea-level, and its mean depth is about 475 feet, its greatest depth being 1,008 feet, — 406 feet below the sea. Its surface is $20\frac{1}{2}$ feet higher than that of Lakes Huron and Michigan, due to the fall at the rapids of St. Mary's River, the only outlet, where the average discharge is 86,000 cubic feet per second. Lake Superior is very near the watershed between Hudson Bay and the Mississippi, and so receives no large rivers, the largest being the St. Louis and the Nipigon. These rivers, with hundreds of small streams, drain 82,000 square miles into the lake. The largest island is Isle Royale, 44 miles long. Keweenaw Point reaches far into the lake. At Grand Isle Bay, about 100 miles west of Sault Ste. Marie, are the pictured rocks, sandstone cliffs from 50 to 200 feet high in many places, of fantastic shape and marked by bands and blotches of red and yellow. The boundary between the United States and Canada is drawn through the center of the lake from its outlet to the mouth of Pigeon River, but includes Isle Royale in the United States. Consult Crossman's *Chart of the Great Lakes.* See ERIE, HURON, MICHIGAN, ONTARIO and ST. CLAIR LAKES; DETROIT, NIAGARA, ST. CLAIR, ST. LAWRENCE and ST. MARY RIVERS; and SAULT STE. MARIE and WELLAND CANALS.

Surabaya (*sōō'rà-bä'yà*), a seaport on the northern coast of Java and on the Strait of Madura. Here the Dutch have a marine arsenal, a cannon-foundry and a mint. There also are machine, sugar and furniture factories. Population 146,944, of whom 8,906 are Europeans and 13,035 Chinese.

Surakarta (*sōō'rà-kär'tà*), a city in the center of Java, but joined by rail with Samarang on the north and Surabaya on the east. It is the home of the native sultan of Surakarta, who is a dependent of the Dutch government. Population 12,000. See JAVA.

Surat (*sōō-rät'*), a city of India, on Tapti River, 160 miles north of Bombay. It stretches for more than a mile along the river in the form of a bow, and is surrounded by suburbs in the midst of gardens. There are four fine Mohammedan mosques, two Parsi fire-temples, three Hindu temples, a clock-tower 80 feet high and the old citadel. Surat was founded in the 16th century, and was three times burned by the Portuguese. After the building of a strong fort in 1546, Surat became one of the greatest trading-cities in India, the English and Dutch as well as the Portuguese establishing themselves there. By the beginning of the 17th century Surat traded with western Europe, India, Arabia, Persia, Ceylon and the East Indies. Here, too, the Mohammedan pilgrims embarked for Mecca. In the 19th century it was pillaged several times by the Mahrattas, lost most of its trade to Bombay, its new rival, and in 1800 came into the hands of the British. It later regained some of its trade and became the largest city in India, but was ruined by a fire, followed by a great flood, in 1837. Surat exported large quantities of cotton during the American Civil War. Population 119,306.

Sur'face-Ten'sion is a phenomenon exhibited when two liquids (or a liquid and a fluid) which do not mix are brought into contact. For instance, a drop of oil placed in a mixture of water and alcohol, which has the same density as the oil, will neither sink nor rise; but it will gather itself into a sphere, *i. e.*, will assume a shape in which it has the least possible surface. In other words, it acts as if it were covered with a thin elastic skin which was continually tending to contract to the least possible area.



A DROP OF OIL FREED FROM GRAVITY

Another illustration of this phenomenon is seen when mercury is placed, in air, on glass, as indicated in the figure. The mercury does not flatten and run over the glass as it would do if gravitation alone were acting upon it; but it gathers itself into a more or less spherical shape. This globule is exactly what we should expect if the mercury were covered with a thin elastic membrane tending, all the while, to contract into the smallest possible area. This tendency of liquid surfaces to become a minimum is known as *surface-tension*. There is no skin or membrane over the surface of liquids; but the particles lying on the surface and very near the surface are in a different physical condition from the particles in the interior of the liquid; hence results this surface-effect, the details of whose explanation would lead us too far. The numerical value of the surface-tension of any liquid is *the force per centimeter which a single surface exerts* across any line drawn upon it. The unit in which surface-tension is measured, therefore, is *dynes per centimeter*. Consult C. V. Boys' *Soap-Bubbles and the Forces which Mold Them*, the finest elementary and popular treatment in the English language.

MERCURY ON GLASS

Sur'rey, Henry Howard, Earl of, an early English poet, was born between 1516 and 1518, probably in Suffolk, and was the son of the duke of Norfolk. In 1532 he accompanied Henry VIII to France, and spent a year in study at Paris with Henry's son, the duke of Richmond, who was betrothed to his only sister. In 1524 he was sent to Fleet Prison for challenging a gentleman to a duel, and next year suffered another imprisonment for breaking windows in the streets at night. In 1544 Surrey went to France as marshal of the invading army, and distinguished himself at the siege of Montreuil, where he was badly wounded. But next year he was defeated by a larger French force, and was superseded by the earl of Hertford. For his bitter speeches against Hertford he was imprisoned, and later, with his father, sent to the Tower, charged with high treason. His only offense was in having added to his own arms those of his ancestor, Edward the Confessor. In vain did he ably defend himself at his trial; he was found guilty and was beheaded on Jan. 21, 1547. His poems were published after his death, with those of Wyatt. They are sonnets, lyrics, elegies, paraphrases of *Psalms* and *Ecclesiastes* and translations. He was the first English sonneteer and one of the best. Consult Morley's *English Literature*. See SONNET.

Surveying (*sûr-vā'ing*), a branch of applied mathematics devoted to measuring land. There are two great branches: plane-surveying and geodesy. Plane-surveying is used where so small areas are measured that the surface of the earth can be looked on as plane. Where large areas are measured, as states and countries, the curvature of the earth must be taken into account and the science of land-measurement becomes geodesy. Plane-surveying is divided into such branches as land-surveying, having to do with fixing property-lines and areas of tracts of land; topographical surveying, having to do with levels and general contours of the landscape; hydrographical surveying, having to do with areas and depths of rivers, lakes and other bodies of water; mining surveying, having to do with the direction and lengths of mining shafts and galleries; railroad surveying; etc. One of the most important geodetic surveys now going on is the American coast-survey. It was started in 1832 by F. R. Hassler, and has now covered nearly the whole coast of the United States, the results being embodied in a sectional map on a scale of one mile to the inch. Eventually the whole country will be mapped out on this scale. Surveying and geodesy are applications of geometry and trigonometry, and involve the measurement of the length and directions of lines. All plane-surveying could be done by the measurement of lengths, but it is most convenient to measure angles also. The chief instruments are the chain or tape, compass, level and theodolite. In geodetic surveying instruments for measuring latitude and longitude must also be used.

The survey of public lands of the United States is in charge of a surveyor-general. The land is divided into townships, each six miles square. The townships between two meridians six miles apart make a range. The townships are then divided into sections a mile square, these containing 640 acres. Land-titles in the western states mostly refer to the original United States survey, and in this respect differ from the land-titles in the older states, where boun-

daries and corners are fixed by various natural and artificial marks. See HOMESTEAD-LAWS and PREEMPTION.

Susa (*sōō'sȧ*), a city of Persia, the Shushan of *Daniel* and *Esther*, the modern Sus and one of the most important cities of the Old World. Its name and ground-plan are traced on Assyrian monuments of the reign of Asur-banipal about 600 B. C. At the time of Daniel's vision "at Shushan in the palace" it belonged to Babylon, but it was brought by Cyrus under Persian rule, and the later kings made it the capital and winter residence of the Persian empire, building a strong citadel and a treasure-house. Alexander is said to have found vast treasures here, and, though Babylon soon became the chief city, Susa still was very rich when it fell into the hands of Antigonus (315 B. C.). Later, its fortifications were destroyed by the Arabs. Its ruins, among them the palace described in *Esther*, cover about three square miles.

Suspen'sor (in plants), an organ of the embryo, by means of which it is placed in proper relation to its food-supply. It is mostly restricted to the embryos of seed-plants, and is usually a more or less filamentous structure, at the end of which the embryo proper develops. See EMBRYO.

Sus'quehan'na River is formed by two branches. The north branch, 350 miles long, rises in Schuyler Lake in central New York; the west branch, 250 miles long, in the Alleghany Mountains. The two unite at Northumberland, Pa., and the river flows south to Harrisburg, southeast into Maryland and, after a further course of 150 miles, into the northern end of Chesapeake Bay. It is a shallow stream, much broken by rapids. In the spring immense quantities of lumber are floated down. Canals have been dug along its banks for 125 miles along the northern branch, and for 124 miles along the western branch. Its lower course is noted for ducks and other wild-fowl. Its chief branch is the Juniata. The Susquehanna is also noted for its wild and picturesque scenery.

Suttee (*sŭt-tē'*), meaning a virtuous wife, a once common usage of India, in accordance with which, on the death of her husband, the faithful widow burned herself on the funeral-pyre with her husband's body, or, if he died at a distance, was burned on a pyre of her own. The custom was practiced in India as early as the time of Alexander the Great, and was grounded by the Hindus on sacred books and laws of theirs. But no countenance to this barbarous rite can be found in the oldest and most sacred Brahman books. Nevertheless suttee, though not enforced on an unwilling victim and not practiced except in certain castes and families of old descent, was made almost necessary for well-born widows by the force of public opinion, unless they were willing to risk their own happiness here and hereafter. The rite came from a belief, common to many savage races, that it was well to send wives, slaves, horses, favorite weapons etc. with great men into the other world, by burying them with them, burning them or slaying them at their tomb. In 1823 about 900 widows were burned in India. In 1829, through the efforts of Lord William Bentinck, any encouragement of suttee was made murder. The custom is now rarely practiced.

Swabia (*swā'bĭ-ȧ*), a southwestern German duchy, stretching from Franconia to Helvetia and from Burgundy and Lorraine to Bavaria. It was so named from the Germanic Suevi, who drove out the Celts of this region in the 1st century B. C. The Alemanni became a part of the Suevic nation in the 5th century, and from this time there were dukes of Swabia. Under the Hohenstaufen emperors, who were Swabians, this duchy became the richest, most powerful and most civilized country in Germany. But when the Swabian line died, Swabia became the scene of feudal wars, and this unhappy state of affairs lasted for centuries. Swabia suffered terribly in the Peasants' War of 1525, in the Thirty Years' War (1618–48) and in the wars of the French Revolution. From the time of the Reformation the rulers of Württemberg (*q. v.*) struggled with the Holy Roman emperors for the control of Swabia. This struggle ended in the founding, in 1806, of the kingdom of Württemberg, which includes most of the old duchy. The name now denotes the south-central part of Württemberg, the adjoining part of Baden and the southwestern part of Bavaria.

Swal'lows, insect-eating birds with long pointed wings, noteworthy for rapidity of flight. Blanchan speaks of the swallow as "the typical bird of the air, as an oriole is of the trees and a sparrow of the ground." There are about one hundred species in all parts of the world. Six are common in the United States. All devour an immense number of insects and are beneficial to the farmer. The common barn-swallow is widely distributed and abundant. It is a little larger than the English sparrow, has a wide wing-spread, above is of a glistening steel-blue shading into black, underneath a warm chestnut-brown and shining buff, tail

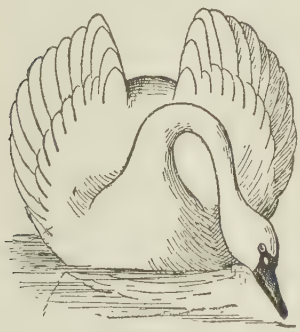
SWALLOW

noticeably slender and deeply forked. The nest is built sometimes outside, sometimes inside, a barn or other building, is made of mud-pellets mixed with straw and is lined with hay, feathers and other soft material.

> The swallow is a mason,
> And underneath the eaves
> He builds a nest and plasters it
> With mud and hay and leaves.

The four to six eggs are white with markings of brown and purple. The cliff or eaves-swallow is a square-tailed bird smaller than the foregoing, which builds numerous nests in colonies under the eaves of barns, other buildings and cliffs. The bank-swallows are our smallest swallows, being about five inches long. They dig tunnels in sand-banks, two or three feet deep with a nest of grass and feathers at the end. The tree-swallow has the under parts white. It nests in hollow trees or in bird-boxes near dwellings. The rough-winged swallow resembles the bank-swallow. It is common in the west, making nests in sand-banks. The purple martin is the largest of our swallows, being about eight inches in length. Swallows resemble the swifts or chimney-swallows and goat-suckers, but the latter belong to quite a different order. All swallows live in colonies. A pair is said to mate for life, but this may be but one of the numberless tales that make up the mass of tradition about this bird. Superstition has long protected the swallow, it being considered ill-luck to kill one. See MARTIN, NESTING-BOXES and SWIFT.

Swan, water-birds famous for their long graceful necks, and related to ducks and geese. They inhabit temperate regions, and feed upon seeds, roots and fish-spawn. They have white plumage, except the black swan of Australia — a very beautiful bird with a long, neck, having a graceful curve. It is a dull black, with white on the wings, and a carmine bill crossed by a white band. The European swan, partly domesticated in parks is pure white and one of the handsomest of all birds. South America has a competitor for grace and beauty in the black-necked swan, a small swan with white plumage, except the head and neck which are dark seal-brown. The common swan reaches a length of about five feet and a weight of 30 pounds. The swans of North America are the trumpeter and whistler swans, with straighter necks and, therefore, less grace and beauty than other members of the group. They are smaller than the common swan.



SWAN

Swansea (*swŏn'sē*), a seaport of Wales, on Tawe River, 45 miles northwest of Cardiff, is the most important city of South Wales. Its growth is due to its tin-plate manufacture, two thirds of the British output being manufactured here. It also is the principal seat of copper-smelting in Great Britain, and in its vicinity are extensive coal-mines. It has large docks, covering 60 acres, a good harbor, and is several hours nearer the open sea than any other considerable port on Bristol Channel. The McKinley tariff greatly injured Swansea's tin-plate trade. Its charter dates from the days of King John. A tower is still standing of the castle built here by the Earl of Warwick in 1099. Population 96,848.

Swa'ziland'. See TRANSVAAL.

Sweatshops. The sweating-system is the engagement of men, women and children by a contractor to produce goods for the wholesale dealer, on which the workers are paid by the piece and the price is made as low as possible. It is called sweating because, as Charles Kingsley in 1850 first showed the world, it enables the contractor to keep cutting the price so low that even the ablest can just live by unceasing toil, while the less able, spurred to their utmost efforts, are often forced to go into debt to the contractor and thus to work for him, on his terms, at their utmost capacity until they can work no longer. Kingsley's revelations were followed by investigations. But the system has not been stopped. A congressional investigation in 1892 showed that 30% of all clothing manufactured in this country was made under the sweating system, under the following conditions: The sweating is done either in a "den," a room hired by the contractor, without any provisions suitable for a crowd of different sexes, and filled to its utmost capacity by people who can not afford to be clean or to stop working if sick; or else at home, where the garments or cigars are often handled by consumptives and filth abounds among the wretched toilers. They in many cases work 15 hours a day, seven days to the week. The chief products of "sweating" are garments, cigars, candy and bread. In recent years many states have taken measures to insure the decent condition of bake-shops and of places where candy is manufactured. New York has a law forbidding the manufacture of garments in bed-rooms or eating-rooms. In Illinois such a law is proposed, with the provision that if broken it is the contractor who engaged work in such a place that must

pay the penalty. It is comparatively easy to secure decent conditions in the "den," through factory-laws, which many states have passed. The matter has not yet received proper attention, however, in any state, unless in Massachusetts. The only way to secure proper wages is the formation of trade-unions among the workers, but this has been found very difficult, in view of the cheap labor poured into our cities from foreign countries. The action of the National Consumer's League in allowing its label to be placed only on goods made under decent conditions of work and of wages and in pledging its members to give the preference to such goods has produced some result, probably, and only requires that all consumers support it.

Swe'den, the eastern portion of the Scandinavian peninsula, is a kingdom. It is over 600 miles long; its greatest width is 200 miles; and it covers 172,876 square miles.

Surface. In the northern parts the land rises from the Gulf of Bothnia to the Kiölen Mountains, which form the boundary between Sweden and Norway, their highest peaks rising above the snow-line. South of this region is the mountainous district made up of the great table-lands of Jemtland and the valleys of Herjedal and Ljungan, where there are good pasturage and timber-lands. The mountainous region further south, from Lake Siljan to Lake Wener, is the mining part of Sweden, and includes the noted iron-mines of Danemora and the copper-works of Fahlun. Lakes Wener, Malar and Hielmar almost cut the country from east to west and, with Lake Wetter, make up a large lake-district, which is the commencement of the most fertile part of Sweden, the lower end of the peninsula between the Cattegat and the Baltic. The lakes cover one eighth of the surface; the largest is Lake Wener, the outlet of which to the Cattegat is the Göta, noted for its picturesque rapids. The rivers are small and unimportant, the largest being the Angerman. Summer and winter succeed each other with almost no spring or fall.

Resources. Usually not enough grain is grown to supply the home-market, though barley does better than oats or rye. Other crops are potatoes, hemp, flax, tobacco and hops. Pine, fir and beech are of great value for timber, tar, pitch, charcoal and firewood. These trees mainly make up the great forests which cover more than a fourth of the surface. Bears and beavers are scarce; but wolves, lynxes, martens, eagles etc. are common. Copper, iron, alum, vitriol, marble, lead, sulphur and a little coal, gold and silver are found; mining is the most important business after farming. Iron and shipbuilding head the list of manufactures. Iron, timber and copper are the chief exports; yarn, wool, leather, coal and cotton the main imports.

Government. The three provinces are Norrland, Svealand and Gothland, but for purposes of government it is divided into 25 governments. After Stockholm the capital (332,738) the largest city, is Göteborg(156,927). The Swedish permanent army of 100,000 men is in part quartered on the landowners, the soldiers working in time of peace as field-laborers in return for their support; in time of war they are paid by the crown. Every Swede between 20 and 25 must serve in the national guard, and a reserve of 284,200 men is formed of conscripts between 21 and 40. Sweden is a constitutional and hereditary monarchy, the succession being in the male line. The king has a council or cabinet of ten ministers. The diet meets every year; the upper house has 150 members chosen for nine years, who must have a certain amount of landed property or income; the lower house has 230 members. A small property qualification is required in the voter, who must be a native having attained his majority.

Education. Education is compulsory, and there are free schools. The University of Upsala was founded in 1476, and has 1,835 students; and the smaller University of Lund numbers 874 students. There are 113 high schools with nearly 25,000 pupils, and 14 normal schools with 1,437 pupils. The state church, to which the king must belong, is the Lutheran; but no civil disabilities attach to those not of the national religion.

History. In early times the Swedes lived in the north of Sweden and the Goths in the south. Eric Edmundson is said to have first conquered the whole of Sweden near the end of the 9th century. At this time Swedish history begins, and we find the Swedes generally at war with their Norwegian and Danish neighbors and busily ravaging the eastern shores of the Baltic. In 1000 A. D. Olaf Schooszkönig was baptized a Christian, and the burning of the national temple at Upsala in the reign of Ingiald (1080-1112) finished the overthrow of the old pagan religion. The murder of King Eric in 1161 was the beginning of a disastrous period of civil wars, lasting 200 years. At length the nobles offered the throne to Margaret, queen of Denmark and Norway, thus uniting the three Scandinavian countries in 1347. In 1523 Gustavus Vasa made Sweden again independent of Denmark, founded a long line of Swedish kings, of which he himself was one of the greatest, and raised half-barbarous Sweden to an honorable place among civilized nations. In Vasa's reign Protestantism was made the state's religion. Gustavus Adolphus (1611-32), one of the greatest generals of his age, spent the greater part of his reign in wars with Poland and Russia for the possession of Ingria, Livonia and other Baltic districts and in defending

Protestantism in Germany. His affairs at home were ably managed by the wise Oxenstierna, who, after the death of Gustavus at the battle of Lützen, carried on the government during the minority of Christina. This strange queen's most popular act was her abdication. Carl XI (1660-97) so greatly increased the kingly power that the diet acknowledged it to be absolute. The warlike career of gifted but reckless Carl XII (1697-1718), who humbled Frederick IV of Denmark and Peter the Great of Russia and dethroned Augustus II of Poland, nearly ruined his country. Ulrica, his sister, was chosen queen on condition of giving up the absolute power wielded by the last two kings. In the reign of Ulrica, the last of the Vasas, and of her husband Frederick of Hesse-Cassel, the country was divided into two factions of nobles — the Hats or French party and the Caps or Russian party. Gustavus III (1771-2) who recovered the lost power of the crown and put down these factions, was murdered Carl XIII (1809-18) was forced to cede Finland to Russia. Carl was childless and chose Bernadotte, Napoleon's general and prince of Pontecorvo, as crown-prince Bernadotte's success in getting possession of Norway endeared him to the people, and he ascended the throne in 1818 as Carl XIV. He ruled ably, and was succeeded by his son Oscar I (1844-59) and his grandsons Carl XV (1859-72) and Oscar II (1872-1907). Gustav V, the present king, succeeded in 1907. In 1905 Norway dissolved the union with Sweden. Population 5,337,055 See CHARLES XII, CHRISTINA, GUSTAVUS ADOLPHUS, GUSTAVUS VASA, GUSTAVUS V. NORWAY and OSCAR II. See Fryxell's *History of Sweden* (English translation).

Swe'denborg, Eman'uel, was born at Stockholm, Sweden, Jan. 29, 1688, the son of a bishop and of noble family. He graduated at the University of Upsala, and, after four years of travel, was given a position in the College of Mines by Carl XII, who became his friend. For some years he busied himself in writing a host of scientific works, mainly practical, on bridges, air-guns, docks, blood-circulation, copper-manufacturing etc. Suddenly his scientific work stopped, and in 1749-56 appeared a Latin work which he called *Heavenly Secrets*. He announced that the Lord had appeared to him and sent him to be the herald of a new church and that his office was to interpret the Word of God according to its true meaning. *The New Jerusalem and Its Heavenly Doctrine* and many other theological works followed. Swedenborg made no effort to found a church, but confined himself to the work of announcing the new doctrines which were to be its basis. As a man he was modest and retiring, genial and happy, and lived a most simple and quiet life. He died at London, March 20, 1772. Since his death, religious societies have been founded on Swedenborg's teachings, and are banded together in America as the general convention, in England as the general conference, of the New Church. Consult Wilkinson's *Life* and compare Emerson's essay in *Representative Men*.

Sweet'bri'er or **Eg'lantine,** a prickly shrub of the rose family, native to the eastern states of the Union and to Canada. It grows densely, yet reaches a height of six or eight feet; about midsummer it bears sweet-scented, pink flowers, and later produces a scarlet or orange-red fruit Its dark-green leaves emit a fragrant odor from their russet-hued glands The sweetbrier is commonly met with in fields and country byways.

Sweet Pea (*Lathyrus odoratus*) a familiar garden-plant much prized for its beautiful perfumed flowers. There are not far short of 100 varieties in cultivation; and to raise them to perfection, the seeds should be planted two inches apart in a rich clay-loam, and it will be well to red-lead them, to protect them from mice and birds. As soon as the plants appear above ground, brush or small twigs should be spread around them for shelter, and later they should be given long stakes for support in their upward climb. Through the growing season occasional shallow cultivation will be required.

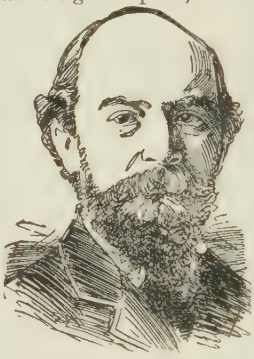
Sweet Pota'to, an edible, sugary vegetable, the tuberous root of a vine-like plant, grown largely in the southern states of the Union and in tropical and semitropical countries. It is also known as the sugar-yam. The sweet potato is rich in food-constituents (sugar and starch), the extent of its cultivation in this country being annually about 50 million bushels. Besides their use, cooked or canned, for the table, the sweet potato is also fed to farm-animals; it is grown best in sandy or loose soils, and is a staple crop in the south.

Swift or **Chim'ney-Swal'low,** a small bird abundant in the eastern United States, nesting in chimneys. Notwithstanding its common name, the bird is not a swallow (*q. v.*), having only a superficial resemblance to the latter birds, while in structure it is very different. It is closely related to the humming-birds and the goat-suckers. The bird is about five and one fourth inches long, of sooty-brown color, with a paler throat. The feathers of the short tail end in sharp bristles, which aid in climbing. There is only one kind in the United States east of the Rocky Mountains, but there are about 50 species inhabiting the warmer parts of the world. In most of them the salivary glands are highly developed, and the secretion from them is used as a glue to hold the nest together and to its support. In China one species constructs a nest that is used in making soup.

Swift, Jon'athan, was born at Dublin, Ireland, Nov. 30, 1667, after his father's death, and was brought up in poverty, what little support he had being furnished by relatives. He spent seven years at Trinity College, Dublin, most of the time in disgrace with the authorities. He was taken then into the family of Sir William Temple, the politician and ex-minister. Four years later his pride drove him away from his patron's house, and he became a clergyman. But he soon threw up the Irish living he had had for two years, and went back to Sir William's service, remaining there till his patron's death in 1699 and publishing an edition of Temple's works (1700-03). In 1704 appeared his first work, *A Tale of a Tub*, the wildest and wittiest satire of the 18th century. This work cost him a bishopric and forced him to be contented for life with the deanery of St. Patrick's, Dublin In politics he at first was a Whig, but in 1710 he joined the Tories and became easily the most powerful pamphleteer in England, *The Conduct of the Allies* being an English classic. The death of Queen Anne put the Tories out of power, and Swift retired to St. Patrick's. His famous *Drapier's Letters*, written in 1724 against the copper-money which was to be supplied to Ireland by an man who had bought the right from the English government, made him at one bound the most popular and most powerful man in all Ireland. A reward of $1,500 was offered for the name of the author, but no one of the many in the secret thought of betraying him. At last the scheme was given up. In 1726 Swift published his most popular work, *Gulliver's Travels*. Almost as great a masterpiece is *The Modest Proposal*, in which he suggests, in seeming cold blood, that in order to relieve their poverty and distress the Irish should sell their children as food for the rich. Swift died on Oct. 19, 1745. See John Forster's *Life of Jonathan Swift* and Thackeray's *English Humorists*.

Swim'ming. The weight of the human body is so little greater than that of water, that it can readily be floated, especially when as in swimming, it is forced through the water by the arms and legs. Benjamin Franklin suggested, as a good way to learn to swim, to wade out breast deep and, tossing an egg into the water in the direction of the shore, to plunge after it; it will soon be discovered that it is easier to swim than to sink. In swimming on the breast the stroke is made by vigorously kicking out the legs — previously bent up — and at the same time thrusting the arms straight ahead in the form of a wedge, then drawing up the legs for another stroke, while the arms are swept through the water in the form of a half-circle. The stroke is made most powerful by keeping the feet as widely apart as possible. Breast-swimming is the easiest method and is always used for long distances. A faster way is to swim on the side; the under arm only being thrust forward, while the other is thrust downward and backward. In over-hand swimming each arm is thrown out of the water alternately, the swimmer at the same time turning from side to side; this is the fastest method. In swimming on the back the arms are not used at all. In treading water the swimmer stands upright and treads water as if walking up a pair of stairs. In floating the swimmer lies on his back, keeping only his face out of the water. It it easier to swim in salt than in fresh water, as the former is more buoyant. The Greek story of Leander's famous swim across the Hellespont was made probable by Lord Byron performing the same feat in 1810. In 1875 Matthew Webb, an Englishman, swam 20 miles in four hours and 42 minutes, and the same year swam the English Channel from Dover to Calais, the tide carrying him on a zigzag of about 50 miles in 22 hours. Agnes Beckwith, a 14-year-old girl, swam five miles in 67 minutes.

Swinburne(*swin'bûrn*), **Algernon Charles,** an English poet, was born at London, April 5, 1837, the son of Admiral Swinburne. He was educated at Balliol College, Oxford, and spent some time in study in France. Two plays, *Queen Mother* and *Rosamond*, were his first writings, followed by his best-known poem, the tragedy of *Atlanta in Calydon*. His later poems are *The Armada* and *An Autumn Vision*. Swinburne enjoys great popularity in America as well as in England, being especially remarkable for his facile metrical invention; and for a time was under consideration as successor to Tennyson in the English laureateship. His chief prose-writings include *Shakespeare*, *Ben Jonson*, *Victor Hugo*, *Wm. Blake*, *Essays and Studies* and *Prose Miscellanies*.


ALGERNON C. SWINBURNE

Swine are among the most important of food-animals. For the wild boars, from which swine are probably descended, see Boar. The word boar is now used of the male hog; the female is termed sow; and the young are called pigs and, when half-grown, shoats. A sow has two litters a year of eight to twelve pigs each or even more; and in ten generations the descendants of a single sow would number over 6,000,000. Pork is held to be unwholesome in warm countries, and the ancient Egyptians, as also the Jews and Moham-

medans, did not use it. The Neapolitan hog is the finest of the Italian breeds; it is black, with a short snout, and upright ears. The Berkshire English swine are both black and white, and make fine bacon and hams. One of the most valuable of English breeds is the Essex, a black hog, which is easily fattened and at 12 to 18 months furnishes from 250 to 400 pounds of dressed meat. Suffolk swine, though small, put on a large amount of fat for the food they eat. Chinese swine are easily fattened, but are chiefly used to cross with English breeds. Pork-packing is one of the great branches of business in the United States. Its leading centers are Chicago, Kansas City and Omaha, in the order named. In the year ending on March 1, 1907, the number of hogs packed and marketed was 30,978,000; the total value of the hog-products exported from the United States in 1905–6 was $128,996,441. See STOCK-RAISING and STOCK-YARDS.

Swit'zerland, an inland country of central Europe and a federal republic. Its greatest length from east to west is 180 miles, its greatest width from north to south 130 miles, and its area 15,976 square miles. It lies between Austria on the east, France on the west, Germany on the north and Italy on the south.

Surface. Switzerland is the most mountainous country on the globe. Its principal chains are the Alps and the Jura. The Alps run from east to west along the southern or Italian frontier, and their windings and spurs fill more than half the country. The mean height of the highest chain is from 8,000 to 9,000 feet. The Jura run northeast from the western corner of Switzerland, and are a series of parallel ridges shutting in long and narrow valleys; their mean height is not over 4,000 feet. In the angle between them and the Alps lies the plain of Switzerland, 1,400 feet above the sea and 100 miles long by 20 to 30 broad. East of this tableland is the Thur hill-country between Lakes Zürich and Constance. The Jura, the plain and the hill-country are the main divisions of northern Switzerland. The Alpine region is divided into the valleys drained by the Rhône; those drained by the Ticino; the Grisons, valleys drained by the branches of the Rhine and Danube; the Bernese Oberland, sloping toward the plain of Switzerland; and the Forest cantons, surrounding Lake Lucerne. Everywhere above 9,500 feet high the mountains are covered with everlasting snow, which descends along the hollows in glaciers to a much lower level, and in this way covers the higher parts of the country with a vast sea of ice. The lowest part of Switzerland is in the valley of the Rhine, between Constance and Basel and the banks of Lakes Zürich and Maggiore.

Resources, Manufactures, Commerce. Good coal is not to be had, and the houses are mostly wooden, so that the forests, which cover one sixth of the surface, are very valuable. The trees, cut on the heights and trimmed of their branches, are slid down the icy slopes to the valleys below and loaded on rafts. The chief business is that of the herdsmen and shepherds, who spend the summer with their cattle on the mountains, living in rude huts called châlets, and there the butter and cheese are made. The plain of Switzerland is a rich farming-region; large quantities of grapes are grown at Vaud and Neuchâtel, and the orchards of the Thur country and Lake Constance furnish *kirchwasser*, the common drink. Out of every 100 square miles 30 are filled with rocks, glaciers and water; 17 with forests; 11 with plowed lands; 20 with meadows; and one with vineyards. The manufactures are chiefly confined to the northern cantons — silk in Zürich, Aargau, Glarus and Basel; cotton in Zürich, St. Gall, Appenzell, Aargau, Glarus and Neuchâtel; watchmaking in Geneva and Neuchâtel; straw plaiting in Aaargu and Lucerne. Though without a seaport, Switzerland's trade in proportion to population has long been greater than that of any European country, except England. The chief imports are wheat, salt, raw silk and cotton; the chief exports are cheese, condensed milk, food-stuffs, charcoal, cattle, silks, cottons, watches and jewelry.

Government, Education, Communication. Each of the 25 cantons of Switzerland rules its home-affairs, in some of the cantons by means of a representative assembly, in others by the *landesgemeinde* or assembly of all the men in the canton. The federal legislature has two houses, the state council and the national council. The president, elected by the federal assembly for one year, has little power, being merely one of the federal council of seven, which is chosen for three years. Almost every head of a family has his plot of ground, and there are no great estates or powerful landowners. There is no standing army, but every citizen is obliged to serve as a soldier. Children are taught at school to bear arms, from the age of eight passing through annual exercises and reviews. In eighteen cantons German prevails; in five, French; in one Italian; and in one, Roumansch, a Latin dialect which lingers in the Grisons. Basel, Bern and Geneva are the centers of the Protestant part of Switzerland, while the Alpine region is almost wholly Catholic. Three years' schooling is required for every child, and in every district are primary and secondary schools. There are many higher and specialized schools that are largely attended; and universities at Basel, Bern, Zürich, Geneva, Lausanne and Fribourg.

Basel University dates to 1460. The attendance in the universities is 5,626, with a total teaching staff of 641. Switzerland has 1,805 postoffices; 2,969 miles of railway; and a very complete system of telegraphs, which is almost wholly under state control. The chief towns are Zürich (186,846), Basel or Bâle (131,687), Geneva (73,185), Bern (54,460) and Lausanne (116,387).

History. The first people of Switzerland were the Helvetii in the northwest and the Rhætians in the southeast, both of whom were conquered by the Romans and had parts of their territories settled by Burgundians, Alemanni and Goths. From the 5th to the 7th century Christianity was adopted. In the early part of the middle ages the country formed part of the Holy Roman empire. In the 13th century civil wars broke out, during which many of the towns obtained special rights and charters. The attack of Emperor Albert I on the great towns caused the men of the forest cantons in 1307 to begin a war against Austria, which gained them freedom in 1315. A league of eight cantons was formed in 1352, followed by other wars with Austria, ending with the famous Swiss victory of Sempach. In 1415 Aargau and Thurgau were conquered from Austria, and Ticino, beyond the Alps, was annexed three years later. In 1476 the battles of Granson and Morat (Murten) were won from Charles the Bold, and in 1499 Emperor Maximilian, was defeated in six engagements. Zürich, under the preaching of Zwingli, became a Protestant city in 1523, followed by Bern and other northern cantons. A religious war was waged against the Roman Catholic forest cantons, in which the Catholics were successful. In the treaty of Westphalia, at the end of the Thirty Years' War in 1648, the European states acknowledged the independence of Switzerland. The French seized Switzerland in 1798, but it recovered its freedom in 1814. The powers of Europe then guaranteed its perpetual neutrality and the inviolability of its territory. Since that time the chief events have been local rebellions and other attempts of the people in the various cantons to get back powers which they had gradually lost to corporations and great families. In 1844 the radical party organized bodies of armed men, called the Free Corps, for the purpose of driving out the Jesuits. The Roman Catholic cantons formed in their defense the league called the *Sonderbund*. After several town-revolutions a majority of the federal diet declared against the Jesuits and the *Sonderbund*, and waged a successful civil war against the Catholic cantons. The present constitution was chosen in 1874. Population 3,463,609. Consult Zschokke's *History of Switzerland* (English translation); *The Swiss Confederation* by Adams and Cunningham; and *Switzerland* in the Story of the Nations Series.

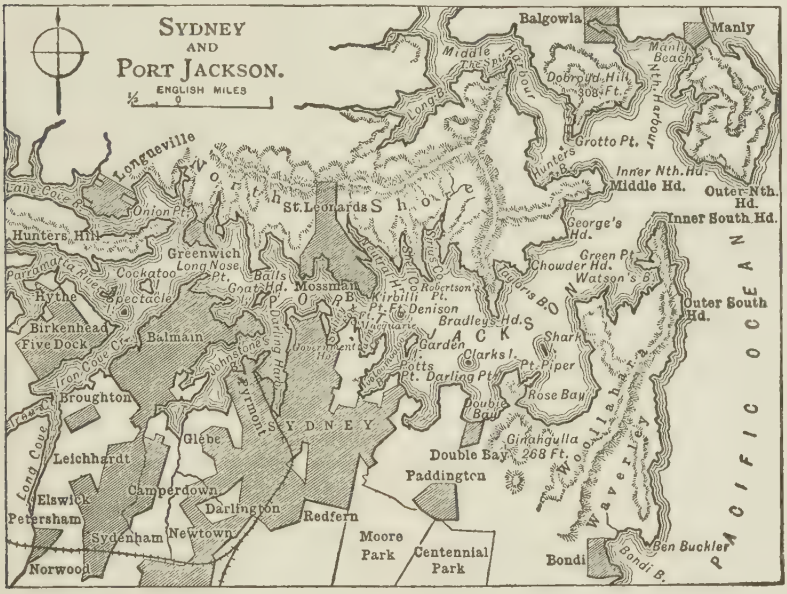
Sword'fish', a large fish of the open sea, having the bones of the upper jaw extended into a long blade. There is only one species, found abundantly in the Mediterranean, less abundantly along the New England coast. It is also found in the Pacific and other seas. The body is rather elongated but stout, the dorsal fin high, the ventrals absent. These fish are dark-blue in color, and range in length from four to fifteen feet or more and from 150 to 800 pounds in weight. They eat nearly all kinds of fish. Rising in the midst of a school, they strike several with the sword and eat them deliberately. They are sought as food, and harpooned from the bowsprit of small vessels. In former years about one and one half million pounds, annually, were brought into eastern ports of the United States.

SWORDFISH

Syc'amore, the common name in the United States of the plane or buttonwood, well-known for its white bark, broad leaves and round balls. The true sycamore is a species of fig, common in Egypt. The wood is so lasting that it was used for mummy cases. It is the tree mentioned in the Bible. The plane or buttonwood is a tree of infinite dignity, rises to a considerable height, and lives to a great age. The height is from 60 to 100 feet, the branches are of wide-spreading habit, and the free peeling of the dark outer bark reveals the glistening white inner bark and gives a mottled appearance to trunk and branches. The tree is vigorous, foliage abundant, leaves bright yellow-green above and paler below. On into winter the fruit remains on the tree, brown balls hanging from the ends of long peduncles. It is a favorite shade-tree, and is distributed generally in the country, being found in rich bottom-lands and along the banks of streams. The wood is reddish brown. Though not strong, it has a beautiful grain and is used for furniture and interior finish, and is also employed for cigar-boxes.

Syd'ney, a city of Australia, the capital of New South Wales (*q. v.*), is on Port Jackson, a bay of the Pacific Ocean. The city looks like an old English town, with fine public buildings, as the exchange, the government-house, the parliament-houses, the treasury, the museum, the national art-gallery, the university and two cathedrals. It has fine parks and a botanical garden of 38 acres.

There are four colleges connected with the university, which has a faculty of 76 members and an attendance of 1,054 students. There also are a college for women, a free museum, a public library of 179,641 volumes and an observatory. It has a fine harbor, with extensive shipyards and docks, and is defended by several forts and batteries. Population 487,900. See AUSTRALIA.



Sydney, Can., next to Halifax, is the most populous place in Nova Scotia. It is a coal-shipping port and may become the terminal port of ocean-liners. It has a deep-water harbor open throughout the year. Population nearly 10,000.

Symbiosis (*sĭm-bī-ō'sĭs*) (in plants), the living together of two kinds of organisms in more or less intimate relation. The word sometimes has a very general application, including even such a case as a vine and the tree upon which it climbs. Generally, however, it is used only in connection with cases of intimate organic union. The most notable case is the association of an alga and a fungus in the formation of a lichen. Various forms of symbiosis are recognized, dependent upon the significance of the relationship between the two symbionts. Parasitism is one form, in which one symbiont is more or less injurious to the other. This form is amply illustrated by the numerous cases in which parasitic fungi attack living plants and animals. Mutualism is that form of symbiosis in which the relation between the two symbionts is mutually helpful. Many botanists consider the lichen an illustration of this, in which the alga and fungus are of help to one another. Helotism is a form of symbiosis in which one organism enslaves another to use its products. In this case the enslaving symbiont is benefited, while the enslaved symbiont is neither injured nor benefited. Many botanists think that this is the form of symbiosis displayed by lichens, the fungus enslaving the alga in order to obtain the food which it manufactures and still protecting it within the meshes of the mycelium. Root-tubercles and mycorrhiza also are illustrations of symbiosis of complex character. In fact, the phenomenon of symbiosis is displayed more extensively among plants than was formerly supposed. See LICHENS, MYCORRHIZA and ROOT-TUBERCLES.

Symmes, John Cleves, an American pioneer, was born on Long Island in 1742. He obtained from Congress in 1788 a grant of 1,000,000 acres along the Ohio between the two Miami Rivers, and a colony from New Jersey made the first settlement, naming the town Losantiville, which was changed by Governor St. Clair to Cincinnati. Symmes City also was founded at North Bend, a few miles below, and for some years was a rival of Cincinnati, until Fort Washington was established at the upper town.

Symmes, John Cleves, nephew of the above, was born in 1780 in New Jersey. He was in the War of 1812, and afterwards settled at Newport, Ky., where in lectures and writings he developed his idea that the earth is a hollow globe, and can be inhabited. He died at Hamilton, O., May 28, 1829.

Symonds (*sĭm'undz*), **John Addington,** an English man-of-letters who wrote largely on Italian history and literature, was born at Bristol, Oct. 5. 1840, and died at Rome, April 19, 1893. His chief writings are an *Introduction to the Study of Dante; Studies of the Greek Poets; The Renaissance in Italy; Italian Byeways;* with *Lives* of Shelley, Ben Jonson, Sir Philip Sidney, Boccaccio, Benevento Cellini, Michael Angelo, Walt Whit-

man and *Shakespeare's Predecessors in the English Drama*. His work is marked by accurate learning and much critical insight. *The Renaissance in Italy* is his chief work. On its seven volumes the author spent eleven years of intelligent labor.

Sympathet'ic Nerv'ous Sys'tem, a nervous system developed in vertebrated animals above the fishes. It consists of a double row of ganglia united by nerve-trunks, and is located within the cavity of the body, along each side of the spinal column. In this way two chains are formed, reaching from the base of the skull to the end of the body-cavity. The ganglia are collections of gray matter or nerve-cells, and nerve-fibers pass through them to and from the spinal cord. The sympathetic system is connected with the central nervous system by numerous nerve-trunks or communicating branches. It also sends branches to the viscera. It acts as a kind of relay center for regulating the blood-supply to the abdominal viscera and assisting in other involuntary actions. See Gray's or Quain's *Anatomy* for a longer description.

Sympetalous (*sĭm-pĕt'al-ŭs*) **Flowers,** those in which the petals are more or less united, as distinguished from those which are polypetalous, in which the petals are entirely distinct from one another. The sympetalous condition is characteristic of families of the highest rank, in which the corolla takes such forms as a bell, urn, tube or trumpet. The noun is sympetaly. Equivalent terms are gamepetalous flowers and monopetalous flowers. See Flower.

Synagogue (*sĭn'ȧ-gŏg*), the Jewish house of worship, the Jewish church. Synagogues were first established in Judæa, when the country was under the Greek and the Persian rule, and were sometimes used for schools. The synagogue has seats and desks on the floor for the men and galleries for the women. There are an ark containing the Hebrew copies of the books of Moses, a platform for the reader and a smaller platform for the preacher or lecturer. The congregation must face the east while certain prayers are recited. Modern synagogues have arrangements for a choir and are more like Christian churches.

Syncarpous (*sĭn-kär'pŭs*) **Flowers,** those in which two or more carpels are organized together to form a single pistil, commonly called a compound pistil. The contrasting term is apocarpous or carpels distinct from one another. See Flower.

Synergids (*sĭn'ĕr-jĭds*) (in plants), two cells which are associated with the egg in angiosperms, and with it form the group of three cells, called the egg-apparatus. This group is situated at the micropylar end of the embryo-sac, to which the pollen-tube comes. The name means helpers, and refers to the fact that these cells are of service in the process of fertilization. During this process one of the synergids becomes disorganized, contributing of its substance to the nourishment of the pollen-tube and its contents. See Embryo-Sac.

Syr'acuse (*sĭr'ȧ kūs'*), **N. Y.,** county-seat of Onondaga County, is on Onondaga Lake, about halfway between Albany and Buffalo. It is a handsome city, with broad, shaded streets and ornamental squares. The state armory, asylums for weak-minded and three asylums for orphans, a home for aged women, savings-bank, courthouse, the new high school, Kirk Block, John Crouse College of Fine Arts, the Hall of Languages and the First Presbyterian church are among the noteworthy buildings. The manufacture of salt has been an industry since 1654 when the springs were visited by the Jesuits and the salt carried to Quebec. The supply is supposed to be inexhaustible, but the brine does not produce the best quality of salt; which is still obtained from the local wells to the extent of 2,000,000 bushels per year. In 1870 the output was over 8,000,000 bushels, but there is lively competition now at Warsaw and in Michigan. The extensive works of the Solvay Process Company are the principal industry, 2,800 men being employed and $5,000,000 invested. Caustic soda, bicarbonate of soda, soda-ash and crystals are the principal products, but carbolic acid, picric acid, coke, ammonia, tar and other coal-tar products are also made by this company. Brine is brought through iron pipes to the works from wells which the company sank 20 miles from the city. It was in the sinking of these wells that the main source of the brine, which had so long been used in Syracuse, was located in a mass of solid salt. Into some wells it was found necessary to discharge fresh water. When it became saturated it then was pumped to other wells and through pipes to the works. The limestone used by this company is brought from Split Rock. Large buckets, suspended on overhead wires and operated by steam-power, carry the material. They run in close connection and continuously, carrying 1,000 tons in 12 hours. The "waste" product is white like marl, possessing no sustenance for vegetation, but has been used to fill the surrounding lowlands. In this way hundreds of acres have been filled to a great depth, and places of deposit are now so limited that Onondaga Lake is to be used as a place of discharge. Besides this enormous business, typewriters and automobiles are extensively manufactured, as are recorders, chilled plows, furniture and shot-guns. In the city are Bessemer steel-works, blast-furnaces and foundries. The city expends $480,696 to maintain its public schools, which have 514 teachers and 22,177 pupils. Syracuse has 116 churches and missions

and four principal hospitals, and each has its training-school for nurses. Carnegie Library has 75,000 volumes, aside from those in substations, and is free to all. In the Court of Appeals is a library of value, supported by the state. Syracuse was first settled by an Indian trader in 1787. In 1780 it was called Salt Point, and the manufacture of salt begun by white settlers. The place was soon called Salina, and grew slowly until it was incorporated as a village in 1825. In 1847 Salina and Syracuse, which were rival villages, were united under the name of Syracuse. Population 119,322. See SYRACUSE UNIVERSITY.

Syracuse or **Siracusa,** a city, once the largest city of Sicily, its walls being 22 miles around and its inhabitants numbering anywhere from 500,000 to 1,000,000. It was formed of five towns, and sometimes was called Pentapolis. Ortygia, the first part of Syracuse, was built on a small island, connected with the mainland by a causeway. The modern city is fortified, and has palaces, churches, convents and a fine cathedral, built on the site of the ancient temple of Minerva. There are many ruins of the ancient city — the old theater, cut out of the rocks, with sixty rows of seats, for 24,000 spectators; ancient quarries, 60 to 80 feet deep, sometimes used as prisons, one of them being called The Ear of Dionysius; a great aqueduct; and extensive catacombs. The fountain of Arethusa, on the island of Ortygia, has been restored by the city. The trade is in wine, brandy, oil, fruits, salt, saltpeter and sulphur. Syracuse was founded by the Corinthians in 734 B. C., and grew rapidly, sending out several colonies. The government was in the hands of a few leading families, and in 487, after a revolution in which the people had driven them out, they returned, and Gelon, the despot or tyrant, became master of Syracuse. He was a great ruler and the city prospered under him, as also under the reign of Hiero, his successor. In 466 Thrasybulus was expelled, and the city enjoyed a free government for 60 years, during which it was victorious over Athens. Dionysius restored the "tyranny," strengthened the city, and overcame Carthage. In 212 B, C. the city, which had joined the Carthaginians, was conquered by the Romans. It was burnt by the Saracens in 878, and has been three times nearly destroyed by earthquakes. Population 32,030. See SICILY.

Syracuse Univer'sity, Syracuse, N. Y., a coëducational institution, has colleges of liberal arts, applied science, fine arts, medicine and laws. It stands on a hill overlooking Onondaga Lake, was founded by Methodists in 1870, and has a hall of languages, Holsen Observatory and a library containing Ranke, the great German historian's, fine historical collection. The faculty number 220, the students 3,200 and the library 90,000 volumes. The productive funds amount to $2,045,351, and in 1907 the income was $826,167.

Syria (*sĭr'ĭ-ă*), division of Turkey, lying on the Mediterranean Sea between Asia Minor and Arabia, including 114,530 square miles. The country is crossed from north to south by a double mountain-chain, Lebanon, the highest part having its summit 10,000 feet above the sea. The valley between the two ranges, Lebanon and Anti-Libanus, is about 2,300 feet above the sea, and was the site of the cities of Heliopolis and Baalbek. This valley separates into two parts, through one of which the Leontes River makes its way to the Mediterranean, while the other descends rapidly to the valley of the Jordan. At the Lake of Tiberias the valley is 650 feet below the level of the sea, and at the Dead Sea, 60 miles below, it is 1,300 feet below sea-level. The region around the Dead Sea is full of salt and without vegetation. The coast is broken by the bays of Tripoli, Beirut, Acre and Saida. The Jordan, Litany (Leontes), Asi (Orontes), Barada and Awaj (the Abana and Pharpar of the Bible) are the principal rivers, with the Euphrates on the eastern border. The plains of Esdraelon, Sharon and Gaza are level tracts, and the region around Damascus is a sandy desert in which are the ruins of Palmyra. Iron, quicksilver, coal, salt and bitumen are the minerals. The climate varies from the cool summers of the slopes of Lebanon to the tropical heat of the Jordan valley, with a dry season from April to October. In spite of imperfect methods and ancient implements in agriculture, the crops are large. Wheat, barley, rice, cotton, hemp, indigo and tobacco are important crops, while all kinds of fruit are grown. Vineyards cover the hills, and forests of cedar and pine the mountains. The horses are very strong and handsome; the broad-tailed sheep is found here only; cattle are small and poor; and wild animals abound in the mountains. Manufactures are unimportant, though the rearing of silk-worms is carried on extensively. Its chief city is Damascus, with a population of 250,000.

The people are of many races and sects. The Mohammedans are mostly Arabs, though there is a small proportion of Turks, the ruling race. The Mohammedans, Druses, Maronites, adherents of the Greek church, Armenians, Catholics, Protestants and Jews represent the religious divisions. The schools are carried on mainly by the Greeks, Catholics and, especially, by the American Protestant missionaries, who founded the Presbyterian college at Beirut. The Syriac language belongs to the Semitic group, and is an Aramaic dialect. Ancient Syriac still is the sacred language of the remnants of the Christian churches of Syria and Asia Minor, though it practically is a dead lan-

guage even to the best educated among them. The oldest book in Syriac still existing is a translation of the Bible, made about 200 A. D.

The kingdom of Damascus, which occupied the central part of Syria, was conquered by the Assyrians about 740 B. C. Along the Mediterranean was Phœnicia, with such cities as Tyre and Sidon, the greatest commercial nations of the ancients, but conquered also by the Assyrians. Anakim, Canaanites, Ammonites and Moabites were tribes living beyond the Jordan and in the southwestern parts of Palestine. The entrance of the Israelites into Palestine took place about 1500 or 1300 B. C., and their power lasted 1,500 years. A part of the nation, the ten tribes, were taken captive by the Assyrians in 721, the Samaritans found in the country at the time of Christ being descendants of the remnant of the Israelites and the colonists from Babylonia, that took the place of the captives. Judah fell before Nebuchadrezzar, but the people were restored to their land after 70 years of exile, though the country was still governed by Persian rulers. The battle of Issus (333) gave Syria to Alexander the Great, but at his death the country was divided, Egypt holding Palestine and Seleucus Nicator ruling northern Syria, where he built Antioch, for many centuries one of the greatest of eastern cities. Syria was conquered by the Romans about 63 B. C., and ruled by Roman officers. In the 7th century A. D. it became a part of the Mohammedan empire, and in the 11th century was in the hands of the Seljuk Turks, whose cruel treatment of Christian pilgrims led to the crusades. The Christian princes ruled only a short time, the land being overrun by the Mamelukes and the opposing forces of Tamerlane. Since 1517 it has belonged to the Ottoman empire. Population 3,675,200. See JEWS and PALESTINE.

Syrin'ga, a genus of Old-World plants, natural order *Oleaceæ* (lilac). They are deciduous shrubs, comprising six known species, native of southeastern Europe and Asia. Flowers in terminal panicles and very fragrant. The term, as popularly used, signifies the beautiful shrub, *Philadelphus Coronarius*, a native of Japan, often seen in gardens and commonly known as sweet syringa or mock-orange. Its cream-colored, fragrant flowers somewhat resemble orange-blossoms.

T

T (*tē*), the twentieth letter, is a nonvocal consonant. From its mode and place of articulation, the tongue touching the gum behind the teeth, it is classed as a voiceless dental or as a palatal, as in *tie, it, note*. *T* is silent in some words, as *chasten*. Unaccented *ti* before a vowel is *sh*, as in *nation*. *T* before diphthongal *u* (that of *use*) is *tsh*, as *nature*. *T* with *h* forms *th;* soft as in *baths, though;* hard as in *bath, thin*. *Th* is *t* in *Esther, phthisic, Thames, Thomas, thyme;* and is silent in *asthma, isthmus*.

Tab'ernacle was the tent first raised by Moses in the desert as a sign of God's presence among the people. It was divided into the sanctuary proper, which formed the front part, and the holy of holies. A sort of court-yard, formed by curtains hung between columns, ran round the tabernacle. The entrance was toward the rising sun, and was shut in by another costly curtain, into which, as in the first covering, figures of cherubim were woven. The court was much larger on the eastern side, for here the people gathered to worship. Here also stood the altar, made of acacia wood, on which a fire was kept burning, and the brazen laver or basin. The sanctuary contained the gilded table holding the showbread, the golden candlesticks and, in the center, the golden altar of incense, upon which the high priest burned incense morning and evening. In the holy of holies was kept the ark of the covenant, an acacia box gold-plated and gold-lined, in which were kept the two tables of the Ten Commandments. On top of the ark were the two cherubim, and between them the symbolical presence of Jehovah — the shechinah. Only once a year, on the Day of Atonement, did the high priest enter the holy of holies, while the sanctuary was the ordinary place of the priests, and the court that of the Levites. The Levites had charge of the tabernacle, carrying it from place to place on the march of the Israelites. The tabernacle was permanently set up in Shiloh, and was probably removed to Nob and thence to Gibeon, from which Solomon seems to have carried it away that all the nation might worship at Jerusalem.

Ta'bor, a celebrated mountain of northern Palestine, rising from the plain of Esdraelon to a height of 1,000 feet, commands the widest and finest view in Palestine. It is thickly clad with forests of oak and other trees. It was renowned from early times as the place of Christ's transfiguration, though it is now believed that at one time a city stood on its summit. In the times of the crusades Tabor was studded with churches and monasteries. Here Deborah and Barak summoned the warriors of Israel before the battle with Sisera; 10,000 Jews were slain near by in a battle against the Romans in 55 B. C.; and at its foot Napoleon gained a great victory over the Turks.

Tabriz (*tä-brēz'*), an old city of Persia, on Aji River, 40 miles from Lake Urumiah. A ditch and a brick-wall with seven gates surround the city. Water, a rare thing in the east, is plentiful. The fine ruin of the Blue Mosque is covered in part with arabesqued, blue tiles. The citadel is a brick-building, whose walls have been cracked by earthquakes. The chief manufactures are leather, silk and gold- and silver-smithing. Tabriz is on a caravan-route, and is a city of business importance, doing a large trade with Russia. Tabriz, the ancient Tauris, became the capital of Armenia in 297 A. D. Zobeida, the wife of Haroun-al-Raschid, greatly enlarged it. It was sacked by Timur in 1392, and after being held by the Turkomans was taken by the Persians in 1500. The place has often been damaged by earthquakes, that of 1721 causing, it is said, the death of 80,000 persons. Population 200,000. See Eastwick's *Three Years in Persia*.

Tacitus (*tăs'ĭ-tŭs*), **Publius Cornelius,** a Roman historian, was born probably about 55 A. D. He enjoyed the favor of Emperors Vespasian, Titus and Domitian, and married a daughter of Agricola (*q. v.*). He held several public offices, became known as an orator, and was a close friend of the younger Pliny, through the appointment of the two to carry on the prosecution of Marius. Eleven of his letters are addressed to Pliny. Tacitus probably lived for a time after Hadrian came to the throne. His *Life of Agricola* (A. D. 98) is one of the finest biographies ever written. His other works are *Histories* (104–110), *Annals, Germany* (98), and his *Dialogue on Orators* (A. D. 79), the first and least valuable of his writings. These histories rank among trusted sources of knowledge of the times of which they treat, and have given their author high rank among the world's historians. But Tacitus is not one of the authors in whom our confidence is increased by rereading.

His account of Tiberius is manifestly unjust, being steeped in the prejudices of the Roman aristocracy and drawn from a poisoned source. He died, it is thought, in 120 A. D.

Tacoma (*tȧ-kō′mȧ*), **Wash.,** county-seat of Pierce County, is on Puget Sound at the head of navigation. The sound, which is from three to five miles wide, narrows near Tacoma to an inlet known as Commencement Bay, less than a mile wide but five long. The city is built on a bluff 200 feet high, overlooking the sound and the Cascade range, with the snowy peaks of Mt. Rainer, also known as Mt. Tacoma, in the distance. The city was laid out by the Tacoma Land Company, an organization by the managers of the Northern Pacific Railroad, which in 1873 bought 16,000 acres near the little village of Rainier, that consisted of one sawmill and the houses of its workmen. They made it the terminus of their road and built two hotels, the second costing $750,000. The salmon-fisheries of Puget Sound, the hop-fields in Puyallup Valley, the great forests of white pine and cedar on the neighboring mountains and the coal, iron and other minerals of the region furnish the materials of the large trade of the city. Regular transport-service has been established between Tacoma and London, trains laden with hops meeting the steamers at New York, and its harbor is a starting-point of steamers for Alaska. The works of the Tacoma Lumber Company cover 80 acres in the city, and it owns 150,000 acres of timber-land and 5,000 of coal-land. More than 40 establishments are engaged in the manufacture of lumber and other products of wood-working factories. The lumber and other products are loaded at the wharves for China, Japan and Australia. There also are large smelting-works and wheat elevators, rolling-mills, car-shops, flour-mills, iron-foundries, smelters, a large private dry-dock, meat-packing establishments and the most extensive fisheries-plant in the United States. Tacoma has ten banks and one foreign branch-bank (London). The public-school system includes a high school, with manual-training department and grade-schools, numbering 29, while the cost of maintaining the schools is $245,000 annually. Tacoma also is the seat of Puget Sound University (M. E.), Washington College, Annie Wright Seminary (Episcopal), Academy of the Visitation (R. C.), the Y. M. C. A's. evening-institute and other institutions. There are fine public buildings, a free library and an ethnological and historical museum. The Great Northern, Northern Pacific and Tacoma Eastern railways serve the city. The following roads are building into it: The Union Pacific, Southern Pacific, Chicago, Milwaukee and St. Paul, Canadian Pacific, Chicago and Northwestern, North Coast, Portland and Seattle and Port Townsend Southern. Population nearly 100,000.

Taft, Lora′do, American sculptor, was born at Elmwood, Ill., April 29, 1860, and graduated at the University of Illinois and at *École des Beaux Arts*, Paris. In 1886 he settled in Chicago, and became instructor in its Art Institute and lecturer on art at the University-Extension-Department of the University of Chicago. He has produced many busts and ideal subjects, and among other fine decorative work of his was that of the horticultural building of the Columbian exposition. The symbolic beauty and fine workmanship of these decorations won great praise. Among his many works are a bust of Schuyler Colfax in Indianapolis, a statue of General Grant and the fine reliefs for the Michigan regimental monuments on the field of Gettysburg. Mr. Taft is a member of the American Sculpture Society and of the Western Society of Artists.

Taft, William Howard, twenty-sixth president of the United States, was born at Cincinnati, O., Sept. 15, 1857. He graduated

WILLIAM HOWARD TAFT

from Yale College in 1878, being salutatorian in a class of 150 men. Two years later he began to practice law in Cincinnati, reporting law-cases for the local journals and becoming assistant prosecuting-attorney for the county (1881–2). During 1887–90 he was a judge in the Cincinnati superior court; in 1890–2 solicitor-general of the United States; and from 1892 to 1900 judge in the Federal circuit-court, receiving the LL.D. from Yale (1896) and becoming dean of Cincinnati Law-School (1898). In 1900 he was made president of the commission to set up civil government in the Philippines, and next year he became the first civil governor. He not only established civil government, with courts, health department, postoffices, public schools and civil-service, but he settled the problem of the friars and their lands and achieved important results in conciliating the Filipinos, Aguinaldo taking the oath of allegiance to

the United States. He became secretary of war in 1904. While secretary he visited Panama, decided difficulties in regard to the government of the canal-zone and vigorously promoted the construction of the canal. He also (1906–8) administered Cuban affairs, and helped to reconstruct the Cuban republic. In 1907 he opened the Philippine legislature, thus inaugurating self-government by the Filipinos in insular affairs; then visited Japan, so strengthening the friendship between it and the United States; and went around the world on a diplomatic mission. He was nominated for the presidency by the Republicans in June, 1908, immediately resigned as secretary of war and was elected by enormous pluralities on Nov. 3, 1908. He is a man of conscience, intellectual power, executive ability, judicial in temperament, but independent and progressive. His public services are what is called constructive statesmanship.

Taganrog (*tȧ-gȧn-rŏk'*), a seaport of southern Russia, stands on the northern shore of the Sea of Azov. It was founded by Peter the Great in 1696. The shallow harbor forces ships to unload into barges half a mile from the quay. Wheat is the chief export, but linseed, skins and wool are also sent out. The place is strongly fortified and is the main port of the Sea of Azov. Alexander I built a beautiful palace and has a monument here. Other buildings are the admiralty, cathedral and marine hospital. French and English gunboats damaged Taganrog by bombardment in 1855. Population 58,928.

Taglioni (*tȧl-yō'nê*), **Maria,** perhaps the world's greatest dancer, was born at Stockholm, Sweden, on March 18 or April 23, 1804. Her father was a noted Italian ballet-master, and under his guidance she first danced at Vienna in 1822. Five years later Paris went wild over the accomplished ballet-girl. She married Count Gilbert de Voisin in 1847, and left the stage. She died on April 23, 1884.

Ta'gus, the largest river of the Spanish peninsula, rises on the frontier of New Castile and Aragon, flows through Spanish and Portuguese territory, and, after 540 miles, falls into the Atlantic by an inlet at some places five miles broad. Near its source, and also near Toledo, the river runs between rock-walls several hundred feet high. The navigable part of the river, 115 miles, is wholly within Portugal. Lisbon and Toledo are on the Tagus.

Tai'lor-Bird, a small bird about the size of a warbler, living in India, Ceylon and southern China. There are about seven species. The common tailor-bird is olive-green above and yellowish white underneath, with a pale, brick-red crown. In making its nest, leaves at the end of a twig are sewed together, or sometimes the edges of one large leaf are united. The bill is used as a needle, and fibers and grass are used as threads. This habit gives its name of tailor-bird. The united leaves do not form the nest, but merely are a receptacle for it. The nest proper is made of wool and vegetable-fibers and is lined with hair.

NEST OF THE TAILOR-BIRD

Taine, Hippolyte Adolphe, a well-known French critic, was born at Vouziers, France, April 21, 1828. He studied at Bourbon College, and in 1864 was made professor of the history and æsthetics of art in the school of arts. One of his first essays was crowned by the French Academy. Among his most important works is *The History of English Literature*, a clear and valuable criticism written in brilliant style. In 1871 the University of Oxford conferred the honorary LL.D., and in 1887 he was elected to membership in the French Academy. His other writings embrace *Journey in Italy*, *Journey to the Pyrenees*, *The Old Régime*, *Notes on England* and *The Ideal in Art*. He died at Paris, March 5, 1893.

Tai-Pings, the name given to the Chinese rebels who rose in 1850 and laid waste some of the best provinces of China. The capture of Pekin by French and English troops in 1860, followed by a treaty giving foreign merchants valuable privileges, made it to the interest of the American, French and English governments to re-establish order in China. Ward, an American citizen, who had taken service under the Chinese emperor, showed a remarkable talent for disciplining irregular troops, and was the chief means of the success of the imperial forces in defeating the rebels at Shanghai in 1860 and 1862. In this year Ward was killed, and "Chinese" Gordon was placed in command of his force, which became famous as Gordon's brigade. The Tai-Pings were defeated in over 16 engagements, and in 1864 almost every important city held by them was captured. The rebellion, however, was not stamped out until 1867. See CHINESE EMPIRE.

Tait, Peter Guthrie, an eminent Scotch physicist, was born at Dalkeith, April 28, 1831. He was educated at Edinburgh Academy and University and, later, at St.

Peter's College, Cambridge, England, where he graduated as senior wrangler and first Smith-prizeman. In 1852 he was appointed a fellow of Peterhouse; and in 1854 professor of mathematics in Queen's College, Belfast; but after 1860 he was professor of natural philosophy in Edinburgh. Few men ever exercised more thoroughly healthful influence on the teaching of physics than did Tait. At the same time he set a wholesome example to students and instructors by a very important series of contributions to knowledge. As evidence of this, witness the two quarto volumes of his *Scientific Papers* published by the Cambridge Press. Among his other important publications may be mentioned *Dynamics of a Particle; Quaternions; Recent Advances in Physical Science;* Thomson and Tait's *Natural Philosophy;* and text-books covering his university lectures. He died at Edinburgh on July 4, 1901.

Taj-Mahal (*tăzh-ma-häl'*), a costly tomb built in Agra, India, by Jehan, the Mogul emperor as a burial-place for Noor Mahal, his favorite wife. It is said to have cost $4,000,000, and building it employed 20,000 workmen for 22 years. Facing Jumna River, where tall cypresses lead to a splendid park in the background, rises the loveliest monument of man's skill combined with nature's material. It is of white marble, 100 feet long and wide and 200 high. It is an eight-sided palace resting on a marble terrace, which is supported by a terrace of red sandstone. A dome flanked by cupolas surmounts the building and minarets rise from the four corners of the marble terrace. Inside and outside are mosaics of precious stones and beautiful tracery. The whole Koran is written in precious stones on the walls. This tomb of tombs has been described by travelers as a "glimpse of Paradise." The Taj-Mahal, where Shah Jehan's own remains also rest, appears more like a palace of the frost-king than a building of alabaster and marble. In the sunlight the great dome seems to float above it like a silken balloon, and the minarets resemble exquisite ivory carvings of feathery lightness. Within, beneath the dome, is a tall circular screen of marble lace, 60 feet around, which encloses the tombs covered with carved inscriptions thickly jeweled. The only light which reaches this heart of the Taj is filtered through the delicate meshes of the screen. A well-known writer says concerning the echo: "The dome receives all sounds within its silvery crucible, transforms them into purest harmony, and then sends them down again as if the upper space were tenanted by a celestial choir chanting an endless requiem."

Yet this marvelous mausoleum is but one among many specimens of Mogul art. The Mogul empire in India existed between 1526 and 1857, when the fashion of extravagant architecture reached its height. Among the great Moguls one should remember Babar the founder; Akbar (*q. v.*) the ruler; and Jehan (*q. v.*) the master-builder. So large were the stones of the splendid structures in comparison with the small and delicate patterns carved upon them, that the world declares that these people "built like giants and finished like jewelers." Among their other works are a mosque at Futtehpore Sikri and a tomb at Secundra by Akbar; the Pearl Mosque; and the Palace at Delhi built by Jehan. The Moguls borrowed characteristics or marks in construction from their Persian and Arabic neighbors. Some of these are the bulbous or turnip-shaped domes grouped about a central, large dome of the same shape; the curving, pointed arch called an ogee; and arabesque as well as floral patterns in their carving. The high portals to the buildings curve inwards, forming an inside porch with three doors elaborately carved to match the rows of pillars, pointed arches and windows. Slender towers called minarets connect the buildings with balustrades, and are charming view-points from which one may look down upon the courts where flowers bloom and fountains play, thus repeating the beauty of the gardens. The stone or brick walls are faced inside and out, usually by marble slabs; and are often inlaid with onyx, jasper, carnelian and other semi-precious stones, which are cemented into cuttings in the marble and in wonderful patterns of vines and flowers. The love of gems for decoration was shown in the making of Jehan's famous peacock-throne, now in Persia. The back of the seat is two golden peacocks set with rubies, sapphires, emeralds and diamonds, with a pearl-fringed canopy above. This was placed in a private audience-hall overhanging the sea. On the walls of the gorgeous room were these words: "If there be a paradise on earth, it is this." Consult Fergusson's *History of Indian Architecture;* Gordon Hearn's *Seven Cities;* J. L. Stoddard's *India;* and the models in the London Museum of Indian Curiosities. See ARCHITECTURE, FINE ARTS and MONGOLS.

Talc (*tălk*), a mineral consisting of magnesium silicate containing a little water, much like mica in appearance and easily divided into thin flakes, which can be bent and are transparent but are not elastic like mica-flakes. It, however, is much softer than mica, can be readily scratched by the finger-nail, and feels greasy when rubbed with the fingers. It is silvery white, greenish white, or green with a pearly luster. It is found in crystalline and in masses. The massive varieties cannot always be separated into flakes. Massive talc, called soapstone, steatite, potstone and French chalk, is quarried in large quantities in Vermont, New Hampshire, Massachusetts, Maryland,

Virginia and North Carolina, and in smaller quantities in other states. Soapstone in slabs is largely used for wash-tubs and for tables in chemical laboratories. It does not crack when exposed to moderate heat, as slate usually does.

Tal'ent, anciently a weight and a denomination of money, varying at different periods and among different nations, as the Greeks, Babylonians and Phœnicians. The Greek talent of weight contained 60 *minæ* or about 80 pounds avoirdupois; the monetary talent among the Greeks was a talent's weight of silver or gold — the monetary unit. The Attic talent of silver, which weighed about 58 pounds avoirdupois, was of the value of about $1,200. Among the Hebrews a talent of silver was equivalent to 3,000 shekels (about $1,700 or $1,800); the gold talent was equal to 10,000 gold shekels — the value being determined by the current price or purchasing power of the metal of which it was weighed, whether of silver or of gold.

Tal'isman, The, a novel by Scott, was published with *The Betrothed* in June of 1825, and written in the true spirit of old romance. Most of its incidents are fictitious, though the ideals of the crusading times are made to live again. The spirit of the Holy Land vies with that of the Scottish border. The action takes place in Palestine, the title being derived from an amulet or charmed stone with which Saladin cures King Richard Cœur de Leon in his illness. This he afterwards presents to Sir Kenneth, the hero, finally discovered to be the prince royal of Scotland on his marriage with Edith the sister of Richard. *The Talisman* has always been a favorite with the young, It glows with bright impossibilities, even to a fault.

Tal'lade'ga, Ala., county-seat of Talladega County, on the Southern, the Louisville and Nashville and the Birm. and Ala. railway, about 50 miles east by south of Birmingham. Here in 1813 was fought a battle between Creek Indians and an American force under Andrew Jackson. It is the seat of Talladega College (Cong.) for colored students, of the Orphan's Home (Presb.) and of state schools for the deaf, dumb and blind. Its industries embrace cotton, knitted goods, chemicals, fertilizers, cottonseed-oil, furniture, cordage, oil, ice brick and marble products. Population 5,050.

Tallahassee (*tăl lȧ-hăs'sē*), **Fla.,** the capital of the state and county-seat of Leon County, stands on high ground, 21 miles north of the Gulf of Mexico. The capitol was begun in 1826. There are railroad-car and machine shops, a cotton-factory, novelty works and cigar-factories. The leading educational institutions are Florida State College, which has a normal department, West Florida Seminary and a fine public-school system. The old Spanish fort of San Louis is near by, and 16 miles away is the well-known and beautiful spring Wakulla. The town is noted for its flowers. Tallahassee was made the territorial capital in 1822, but was not laid out until 1824. Population 3,311.

Talleyrand (*tăl'lĭ-rănd*) **de Perigord, Charles Maurice,** Prince, a famous French diplomatist, was born at Paris, Feb. 14, 1754. His father, Count of Talleyrand, would have had him enter the army, had he not been accidentally lamed when a child. So he became a priest and rose to be bishop of Autun. As a member of the national assembly of 1789 he was a hearty friend of Mirabeau, and at the feast of the federation in the next year he headed a procession of 200 priests wearing the national colors over their white robes and performed mass on the altar set up in *Champ de Mars*. After the fall of Louis XVI Talleyrand went to England and then to the United States, where he reaped a fortune by speculation. He went back to France as soon as his name was crossed off the list of exiles, and in 1797, as the newly appointed minister of foreign affairs, welcomed Napoleon on his return from his famous Italian campaign. He greatly helped Napoleon to seize absolute power, and as his minister of foreign affairs became the ablest diplomat in Europe. An estrangement, however, separated the coworkers, Talleyrand resigning in 1807. To his intrigues was chiefly due Napoleon's fall in 1814, and for this treachery he was for the third time made foreign minister by Louis XVIII. At Napoleon's return from Elba he was in Austria as French commissioner to the Congress of Vienna, but after Waterloo he accompanied the king to Paris. He soon resigned his office, but retained great influence, men of all parties thronging his salon. He came to the front again after the revolution of 1830, as ambassador to England. His personal *Memoirs* and his *Memoir on the Commercial Relations of the United States* are the most valuable of his writings. He died on May 20, 1838.

Tallien (*tă-lyăn'*), **Jean Lambert,** a French revolutionist, was born at Paris in 1769. He first came to the front in 1792 as editor of a Jacobin newspaper, which gave him great influence. As secretary of the commune he helped on the September massacres. He was a supporter of Marat, and was eager for the death of Louis XVI and the Girondists. In 1793 he was sent to Bordeaux to root out this party, where he gained lasting infamy by his reckless cruelty. In 1794 he came back to Paris to become president of the Convention; and, to save himself from the attacks of Robespierre, he organized the destruction of the Terrorists, though he had himself perhaps been more guilty than they Tallien now became one of the most influential men, but his past crimes could not be forgiven, and in 1798

he was forced to leave the council of 500. He died on Nov. 16, 1820.

Talmage (*tăl'măj*), **Thomas De Witt,** American Presbyterian clergyman and lecturer, was born at Bound Brook, N. J., Jan. 7, 1832; was educated at the University of the City of New York; and graduated from the Theological Seminary of New Brunswick, N. J. He was pastor successively of Reformed Dutch churches at Belleville (N. J.), Syracuse (N. Y.) and Philadelphia (Pa.), and from 1869 to 1874 he was in charge of Central Presbyterian Church at Brooklyn, N. Y. In 1895 he accepted a call to First Presbyterian Church, Washington, D. C. He edited *The Christian Herald*, and was also editorially connected with *The Christian at Work*, *The Advance* and Frank Leslie's *Sunday Magazine*. Besides many volumes of lectures and sermons he published *Around the Tea-Table*, *The Marriage-Ring*, *Old Wells Dug Out*, *The Pathway of Life*, *Everyday Religion*, *From Manager to Throne*, *Woman* and *Sundown*. He died on Apr. 12, 1902.

Tal'mud. See LITERATURE, JEWISH.

Tam'arack. See LARCH.

Tam'arind, a tree cultivated in India for its fine shade as well as for its fruit. It also is grown (though of the wild type) in other tropical countries, as Florida and the West Indies. It is known as the Indian date, its long, many-seeded pods containing an acid pulp, which is used medicinally and as a pleasant drink, and also as an ingredient in curries and in making sherbet. The tree has a hard wood, of value in cabinet-work, and is exceedingly handsome.

Tambourine (*tam-bo͝or-ēn'*), a very old musical instrument, used by Basques, Italians and Gypsies. It is a piece of parchment stretched on a hoop furnished with little bells, and is sounded by the hand, fingers or elbow. It is used to accompany singing and dancing, and has been adopted by the Salvation Army.

Tam'erlane. See TIMUR.

Tam'many Society, the most powerful political club in the world, is an organization of the Democratic party in New York City, and was founded in 1789. It was nearly ruined at the time when the city and it were under control of the Tweed ring. It has been more or less opposed by outside Democrats in New York at various times, but to-day is supreme in the councils of the party in New York. See TWEED.

Tam'pa Bay, an inlet of the Gulf of Mexico on the western coast of Florida, south of Cedar Keys and north of Charlotte Harbor, on which the city of Tampa is situated. The bay, known also by its old Spanish name of Espiritu Santo, is divided in its upper waters by a peninsula into Old Tampa Bay and Hillsboro Bay. Its length is between 35 and 40 miles, while in breadth it varies from six to 14, with a depth of 22 feet at its main entrance, which is protected from the Gulf by a number of keys or low islets.

Tampa, Fla., a thriving city and port of entry at the head of Tampa Bay and the mouth of Hillsboro River, the capital of Hillsboro County, 30 miles from the Gulf of Mexico, in western central Florida. It has a spacious harbor, and has steamship connection with Mobile, New Orleans, New York, Havana and Key West. It has railway connection with the Florida Central and Vennisula, the Savannah, Florida and Western and other railroads. Its chief industry is the manufacture of cigars; fruit-culture, the fishing-trade and the shipment of phosphate are other occupations of its people. Population 24,220.

Tampico (*tăm-pē'kō*), a Mexican seaport in the State of Tamaulipas, on the Panuco, five miles from the Gulf of Mexico and 235 miles northwest of Vera Cruz. Its harbor has a dangerous bar, and is unsafe. Trade is carried on chiefly with New York, New Orleans and Liverpool. Population 12,000.

Tanager (*tăn'ā-jẽr*), the name for members of a large family of birds mainly confined to tropical America. There are about 350 species. Two forms abound in the eastern and southern United States. The scarlet tanager is our most brilliantly colored bird, and is familiar to most people who live within its range. It is a little more than seven inches long; the male, during the breeding period, is bright red with black wings and tail; the female is clear olive-green above and greenish yellow below. After the nesting-period the male becomes colored like the female. They inhabit both high and low woods and usually nest in oaks. Our other tanager is the summer redbird, a more southern species, which ranges north to New Jersey and southern Illinois. The male is bright rose-red throughout, with the wings a little dusky. The female is dull olive above and yellow below.

Tananarivo (*tä-nä'nä-rē-vō'*) or **Antananarivo,** the capital of Madagascar (*q. v.*), is built on a long hill 7,000 feet above the sea. The houses are of wood or bamboo, roofed with bamboo or mats. The habits and ways of the people have been greatly bettered under the teaching of missionaries. Population 65,000.

Tancred (*tăn'krĕd*), an Italian prince, was born in 1078. He joined the crusaders under Bohemond, his cousin, the son of Robert Guiscard, the crusader. He fought bravely at the siege of Nicæa in 1097, and in the battle of Dorylæum saved the Christian army from being cut to pieces. In the massacre which followed the capture of Jerusalem, whose walls he was one of the first to mount, he alone had any mercy for the conquered, in whose behalf he risked his own life. Tancred defeated the advance guard of the sultan of Egypt, and had a great share in the capture of Ascalon. After tak-

ing Tiberias he was made prince of the city. He defended Antioch against great odds, whose governor (his cousin Bohemond) had left to raise recruits in the west. Tancred carried his arms as far as Tripoli, and succeeded in driving the Saracens out of Syria. He died at Antioch in 1112. He is one of the leading heroes of Tasso's famous poem of *Jerusalem Delivered.*

Taney (*tą'nĭ*), **Roger Brooke,** chief-justice of the United States, was born in Calvert County, Md., March 17, 1777. He graduated at Dickinson College, Pennsylvania, studied law, and took part in politics as a Federalist. He afterwards became a Jackson Democrat, and was made attorney-general in President Jackson's cabinet in 1831. Two years later he was appointed secretary of the treasury, as his chief knew that he could be depended upon to remove the government deposits from the United States Bank to local banks, the refusal to do which had caused the dismissal of Secretary Duane. Taney succeeded the great Marshall as chief-justice of the supreme court in 1837. His most famous decision was that in the Dred-Scott case in 1857, in which Scott, a negro, brought suit to gain his freedom on the ground of his having been carried by his master from the slave-state of Missouri into free territory. The decision, denying the right of citizenship to negroes and the authority of Congress to keep slavery out of the territories, caused greater excitement throughout the country than any decision of the supreme court before or since. Chief-Justice Taney died at Washington, D. C., Oct. 12, 1864. See *Life* by Prof. Samuel Tyler.

Tanganyika (*tăn-găn-yē'kä*), meaning the meeting place of waters, is the name of a great Central African lake discovered by Burton and Speke in 1858. It lies south of Lakes Albert Edward and Albert and northwest of Lake Nyasa; is about 400 miles long and from 10 to 60 wide; and is about 2,700 feet above the ocean. A wide bay at the southern end was named Lake Liemba by Livingstone. The eastern coast is hilly, and the western coast mountainous and covered with forests. There are many small rivers flowing into it, and the Lukuga flows from it into the Kongo. Ujiji, where Stanley found Livingstone, is the principal town on the lake. Telegraph lines now run through the Nyasan protectorate to Tanganyika.

Tangier (*tăn-jēr'*), a seaport of Morocco near the western entrance of the Strait of Gibraltar, is built on high ground and is defended by forts. It is the principal center of commerce in Morocco, has important trade with Europe, doing a foreign business of $4,000,000 yearly, and is the residence of consuls and the diplomatic corps sent to Morocco. Tangier, once called *Tangis*, is an old city, and is thought to have been founded by the Carthaginians. It became the capital of a Roman province, was held by the Portuguese for nearly two centuries, and in 1662 was presented to Charles II of England as part of the dowry of Catherine of Braganza. England held it for 22 years. In 1844 it was bombarded by the French. Population about 35,000.

Tanjore (*tăn-jōr'*), an Indian city, 180 miles southwest of Madras. There are two strong forts; in the larger one is the rajah's palace, in the smaller, one of the finest of Indian pagodas. Silk, muslin and cotton cloths are manufactured. Tanjore was first the capital of a Hindu state of the same name, which was conquered by the Mahrattas, and fell into the hands of the British about 1800. Population 57,870.

Tannhäuser (*tän'hoi-zĕr*), a famous knight of the middle ages, who, according to the German legend, goes to Venusberg and enters the cave-palace to behold the wonders of Lady Venus and her court. Conscience-smitten at the life of careless pleasure he lives here, he betakes himself to Rome to crave forgiveness of the pope. The pope, however, holding a wand in his hand tells Tannhäuser that he can as little get God's forgiveness as that dry wand can become green again. In despair the knight goes back to Lady Venus in the mountain. But three days afterwards the wand begins to sprout and bears green leaves, and the pope at once sends messengers to every country, but in vain — Tannhäuser can nowhere be found. Such is the story as told in the popular ballad once sung all over Germany. On this *saga* Wagner based his well-known opera of *Tannhäuser.*

Tannhäuser and the Singers' Contest at the Wartburg is the title of a music drama by Richard Wagner, who wrote both words and music. First performed at Dresden, Oct. 20, 1845. The conception of the opera occurred during a visit of Wagner to the castle of Wartburg, in the Thuringian Valley, in the spring of 1842. The castle was the traditional scene of the contests between the *minnesinger* and the knightly poets, whom the landgraves of the 13th century assembled for tournaments of song. Schumann mentions the opera as one "which cannot be spoken of briefly," adding that "it certainly has an appearance of genius."

Tan'nin or **Tan'nic Ac'id** is of great importance in tanning leather. The chief source of tannin is oak-bark, though in America hemlock-bark is much used, while the mimosa or wattle-barks of Australia are important. However, tannin is found in the bark and leaves of most forest-trees, as the elm, willow, horse-chestnut, and pine, and in many fruit-trees as the pear and plum. Coffee, tea and, especially, Paraguay tea also contain tannin.

Tan'ning. See LEATHER.

Tantalus (*tăn'tà-lŭs*), noted in Greek myth for the punishment he received in the lower world. He was the son of Zeus, and for making known the counsels of his divine father or for other reasons, — the stories differ, — he was in the lower world stricken with a fearful thirst, and had to stand up to the chin in a lake, the waters of which escaped him whenever he tried to drink. Clusters of fruit hung over his head, but missed his grasp whenever he reached for them; at the same time he was in terror lest a huge rock, hung over his head and ever threatening to fall should crush him. From Tantalus comes "tantalize."

Tapajos (*tä'pà-zhōsh'*), an important river of Brazil and a branch of the Amazon, is formed by the junction of the Arinos and the Juruena. After flowing north for over 1,100 miles, the Tapajos falls into the Amazon 20 miles below the town of Santarem. Its upper waters are only 18 miles from those of the Paraguay. There is one fall of 30 feet, but otherwise the river is navigable for the greater part of its length.

Tap'estry, an ornamental figured cloth, used for lining walls and covering furniture. The Jews and Egyptians were skillful tapestry workers. In France the ladies of the nobility used their needles in making beautiful tapestry for the adornment of churches and monasteries. About the 9th century this work began to be done by the loom. The Flemings excelled in tapestry-weaving, and in the 14th and 15th centuries the factories of Brussels, Bruges, Antwerp, Lille and Valenciennes were noted, and in the next century the factory at Fontainebleau. The art of weaving tapestry was introduced into England near the end of the reign of Henry VIII. A famous and very old factory is that of the Gobelins at Paris. So slow is the work that 39 square inches are considered a fair year's work for one artist. Perhaps the most remarkable piece made by hand is the Bayeux tapestry (*q. v.*), which commemorates the Norman Conquest. It is 214 feet long, and is of great historical value, as it shows the old Norman costumes in great detail, and also pictures events of the conquest not mentioned by any chronicler.

Tap'io'ca, a farinaceous substance prepared from cassava-meal, which, while moist or damp, has been heated for the purpose of drying it on hot plates. By this treatment the starch-grains swell, many of them burst, and the whole agglomerates in small, irregular masses or lumps. In boiling water it swells and forms a viscous jelly-like mass.

Ta'pir, the name for several thick-skinned mammals with elongated snouts, inhabiting India, the adjacent Malayan islands and Central and South America. The tapirs, united with the rhinoceroses and horses, form a group of odd-toed ungulates or hoofed animals, all other hoofed animals having an even number of toes. The tapirs have three toes behind and four on the front feet, but only three are used. The Old-World tapirs are larger than those of the New World, the common Indian form being eight feet long and thirty-nine inches high at the shoulders. The legs and the front part of the body are black, but the sides and back of the hinder portion are white. Those of the New World are brown or blackish when adult. The common South-American form is about seven feet long, and inhabits thickly wooded districts as far as the Andes. It is there replaced by a mountain form living at altitudes of 7,000 and 8,000 feet. There are two species in Central America whose habits are little known. Tapirs commonly feed on young leaves, shoots and fruits. Those of South America are destructive to plantations. They are hunted for their flesh and hides.

MALAY TAPIR

Tar, an impure turpentine got by burning the wood of pine and cone-bearing trees and by distilling peat, bituminous coal and shale. The early Greeks made tar, and the people living along the Gulf of Bothnia now make it in the same way, by burning wood in a heap covered with turf, much as charcoal is made. In Sweden trees are partly stripped of their bark, and, when cut down some six years later, are found much richer in resinous matter. In the United States most wood-tar comes from North Carolina, though it is also made in other parts of the country. It is usually made of pitch-pine, and is burned in tar-kilns, which are piles of pine-billets in the form of an inverted cone, covered with logs, green twigs and earth. The kiln is lighted at the top, and the tar runs out through a wooden spout at the bottom.

Coal-tar is made when illuminating gas is manufactured from bituminous coal. For a long time this tar was a mere waste-product, but now it is widely used as a covering to protect iron-work from the weather; and the pitch is used for pavements, roof-covering etc. By distilling coal-tar, benzine or benzol and other volatile products are obtained, which are very valuable as raw materials in the preparation of artificial dyes.

Tarantula (*tà-răn'tū-là*), the name commonly applied to any large, running spider of warm countries. The true tarantula is

a native of southern Europe, and got its name from being common in the neighborhood of Taranto, Italy. The bite was considered very dangerous, and was fabled to produce an epilepsy which could be cured only by dancing, until exhausted, to lively music of a particular kind. The tarantulas, using the name in its wide meaning, are dark-colored, hairy spiders, with mandibles that work up and down, instead of sideways, as is the direction in most other spiders. They live under rocks and in holes which they make in the ground and line with silk. They do not spin webs, but rush upon passing insects and other prey.

Tar'bell, Ida Minerva. A noted American writer upon historical and economic subjects. Born in Erie County, Pennsylvania, on Nov. 5, 1857, she grew up in the oil-region. She graduated with honors from Titusville High School and Allegheny College, and studied in Paris, 1891–4, at the Sorbonne and the College of France where she began to make her mark as an historical writer. She for eight years was associate-editor of *The Chautauquan*, later was on the editorial staff of *McClure's Magazine*, and finally was an associate-editor of it. Among her writings are *Short Life of Napoleon Bonaparte; Life of Madam Roland; Life of Abraham Lincoln*; and *History of the Standard Oil Company*. She has written extensively for magazines.

Tarifa (*tȧ-rē'fȧ*), a famous Spanish city, is 25 miles southeast of Cape Trafalgar. It has old walls, towers, a fortress and a Moorish castle. Tarifa was founded by the Moors, who forced all vessels passing through the Strait of Gibraltar to pay tribute at this town. From this fact comes our word "tariff." The Castilians captured Tarifa in 1292 and held it in the face of several sieges by the Moors. The French besieged it in vain in 1811, but captured it in 1823. Population 11,725.

Tar'iff, a table or catalogue of duties charged on different kinds of merchandise when imported into a country. The first tariff-act in the United States was drawn up by Alexander Hamilton, then secretary of the treasury, in 1789. Its purpose was to put money into the country's empty treasury. It listed only 51 articles, and charged duties ranging from 5 to 15 per cent. Between 1789 and 1804 six acts amending or adding to the first measure were passed. The tariff of 1812 was a war-measure and doubled all import duties. The Lowndes-Calhoun bill of 1816 was the first tariff-measure enacted to protect industries in addition to producing a revenue. Many manufactures had sprung up during the war, and this bill was passed avowedly to protect these young industries. It was not wholly set aside till 1842. Under it *ad valorem* duties ranged from 7½ to 33 per cent. It was followed by Clay's tariff of 1824 and the "tariff of abominations," as it was called, of 1828, both of which further raised duties. The modifying tariff of 1832 endeavored to readjust duties more equally. The compromise tariff of 1833 provided for taking off one third of the duties each year until a uniform rate of 20 per cent. should be reached. The Polk-Walker tariff of 1842 owed its passage to Robert J. Walker, President Polk's secretary of the treasury. It remained in force until 1861. It threw overboard the idea of protection and aimed to be a tariff for revenue only. Duties were reduced considerably, and in 1857 further reduced to an average of 15.66 per cent. The Morrill tariff of 1861 was avowedly protective, and more than doubled existing duties, which were raised higher yet by the bill of 1883. The McKinley tariff-bill of 1890 increased duties about 60 per cent., though it also enlarged the free list. A special section which has proven to be of value in enlarging our foreign trade was inserted in this bill. It gave the president power to remove from the free list sugar, molasses, coffee, tea and hides in the case of any country which charged unreasonable duties on the products of the United States. This is known as the reciprocity section. The election of 1892 placed in power the Democratic party, which was pledged to a tariff for revenue only. Accordingly, a measure known as the Wilson bill was passed, and became law in 1894. This law removed duties from raw materials, and effected lower duties in general. It also provided for an income-tax, which was set aside by the supreme court. In 1896 the Republican party again came into power and the Dingley law was passed, which established a tariff on somewhat lower lines than the McKinley law.

Tark'ington, Newton Booth, American novelist, was born at Indianapolis, Ind., on July 29, 1869, and graduated at Princeton in 1893. When, later, pursuing a business career, he discovered gifts in himself as a writer, especially of realistic and romantic stories. His first notable work, *The Gentleman from Indiana*, met with instant success, and was followed in 1900 by *Monsieur Beaucaire*, a novelette subsequently dramatized and produced on the stage by Richard Mansfield. In 1902 appeared *The Two Vanrevels*, in 1903 *Cherry*, in 1905 *The Conquest of Canaan* and *The Beautiful Lady*, besides *In the Arena: Tales of Political Life*. In 1902 he entered practical politics as a member of the Indiana legislature.

Tarpeian Rock (*tär-pē'yan*), at first the name given to the whole Capitoline Hill in Rome, but afterwards only to the southern part of it. Tarpeia, daughter of the governor

of the Roman citadel on the Capitoline, covetous of the golden bracelets worn by the Sabine soldiers and tempted by their offer to give her what they wore on their left arms, opened the gate of the fortress to the Sabine king. Keeping their promise to the letter, the soldiers crushed Tarpeia to death beneath their shields, which were carried on the left arm, and she was buried on the part of the hill which bears her name. Afterwards traitors were often hurled from the Tarpeian rock.

Tar'pon or **Tar'pum,** a prized fish-food, akin to the herring, found off the Florida coast and in the Gulf of Mexico. This marine fish usually is six or more feet in length, and catching it furnishes exciting sport for fishermen with rod and reel. It has large, silvery scales, used in fancy-work. Another variety of the fish is found in Indian waters.

Tar'quin, the name of two kings of Rome. According to the story, Lucumo, the son of a Corinthian nobleman who had settled in Etruria, resolved to improve his fortune by going to Rome. On the way an eagle swooped down and snatching off his cap carried it high into the air, and then, descending, placed it on his head again. His wife, who was skilled in augury, prophesied from this omen the highest honors for her husband, who took the name of Tarquin. He became the guardian of the children of King Ancus Marcius, and was chosen to succeed him on the throne. His reign (B. C. 616–578) was a glorious one. He waged successful war against the Latins, Sabines and Etruscans, built Roman sewers which remain to this day, laid out Circus Maximus and the Forum, began the building of the Capitol, and instituted the great Roman games. He was, however, murdered after a reign of 38 years, through the influence of the sons of Ancus Marcius. His son, Tarquin the Proud, in 534 B. C. murdered King Servius Tullius, his father-in-law, and usurped the crown. He ruled ably though tyrannically, and made Rome the acknowledged head of Latium. But his heavy taxes and, especially, his persecution of the popular party, which had supported Servius Tullius, caused wide-spread discontent. At the samé time a fearful omen encouraged his enemies; from the altar in the royal palace a serpent crept forth and devoured the entrails of the victim. At last came the rape of Lucretia by Sextus, the king's son. The senate deposed the tyrant, the army revolted against him, and he was forced to flee. Three attempts to reinstate him failed, and Tarquin's reign was followed by a republic at Rome. He died in B. C. 510 or 495. See ROMAN EMPIRE.

Tar'rytown, N. Y., an attractive and historic village in Westchester County, on the eastern bank of the Hudson, opposite Nyack, and on the New York Central and Hudson River Railroad, 25 miles north of New York City. It is situated on Tappan Bay, above Irvington and below Sing Sing, and has many fine residences, besides schools and churches, including a Dutch church which dates from the close of the 17th century. Near by (at Irvington) is Sunnyside, the home of Washington Irving, where he sleeps in Tarrytown churchyard, rendered famous as the site of Irving's *Legend of Sleepy Hollow.* The village is also historically known as the place where Major André (*q. v.*) was captured. Tarrytown had an early settlement, though incorporated as late as 1870. Here are Irving Institute, Tarrytown Lyceum, the Catholic Institution of Mercy, a public library and industrial establishments and drill-works. Population about 5,900.

Tar'sus, a city of Asiatic Turkey, on the Cydnus, about ten miles from the Mediterranean. It is built of stone, and is surrounded by a rich country. There are mosques, caravansaries and public baths. Wheat, barley, cotton and gall-nuts are exported. Tarsus is said to have been founded by Sardanapalus. Alexander captured it and it became a large and important city under the Romans. Tarsus is noted as the birthplace of St. Paul (*q. v.*). Population about 20,000, former population 100,000.

Tartar'ic Ac'id is found in grapes, tamarinds, pineapples and several other fruits, usually in combination with potassium. It is generally got from argol, which is produced during the fermentation of grapes. The acid is usually seen as colorless, transparent crystals, soluble in water and alcohol. The crystals, when gently warmed, become strongly electric. Tartaric acid is largely used in calico-printing and dyeing, for making lemonade and in drinks and lozenges as a medicine. The acid potassium tartrate, called cream of tartar, is extensively employed as an ingredient of baking-powders.

Tar'tars, in the widest sense include all the tribes living in the tablelands of central and northern Asia who are not of Aryan blood, that is, the Tartars proper, the Kirghiz, the Kalmucks, the Manchu Tartars, the Mongols proper and the Tungusians. In a narrower sense they comprise the Mongolian or Turanian people of Turkestan (*q. v.*). These tribes are the wandering Kirghiz, the Uzbegs, who are the ruling class, the Kiptchaks, the Buddhist Kalmucks of eastern Turkestan and many other tribes. In central Asia the words Turk and Tartar are used interchangeably to mean Mongolian. Tartar tribes, as distinct from Turks, formed the bulk of the great Mongolian migrations from the 4th to the 10th century, which planted the Tartar in southern Russia. Tartars and Turks (*q. v.*)

made up the hordes which followed Genghis Khan (*q. v.*) and Timur (*q. v.*).

Tar'tary, the name given formerly to a broad belt of territory reaching from the Seas of Japan and Okhotsk to the Caspian or perhaps to the Don. Khiva was formerly called Independent Tartary; and the Crimea was called Little Tartary, also Crim Tartary, from the name of the tribe which settled there in the 13th century. The name is applied now, if at all, to the Turkestani region.

Taschereau (*ta'sh'-rō'*), **His Eminence Elezear Alexander,** the first Canadian cardinal, was born at Ste. Marie-de-la-Beauce, Quebec, Feb. 17, 1820, his father being a judge of the queen's bench and his mother the daughter of the speaker of the first legislative assembly of Canada. He was educated at Quebec and Grand Seminaries, ordained in 1842, for four years a professor, later director and at last superior of Grand Seminary, and in 1860 director of Laval University as well. Vicar-general of the archdiocese of Quebec in 1863, he was consecrated archbishop in 1871 and elevated to the cardinalate in 1886. He died in Quebec, April 12, 1898.

Taschereau, Hon. Sir Henry E., was born in 1836. He was called to the bar of Quebec in 1857, and was a member of the Quebec legislature from 1861 to 1867. He was appointed a judge of the superior court of the province in 1871 and in 1878 a judge of the supreme court of Canada. He has written several textbooks on law. He became chief-justice of the court, and recently resigned.

Tashkend (*tăsh'kĕnd'*). a city of Russian Turkestan (*q. v.*), on Saralka River. It stands in a rich plain, and is surrounded by a wall 12 miles around, which is pierced by 12 gates. The houses of mud, thatched with reeds, are scattered among gardens and vineyards. A fortified castle, which is the home of the governor, mosques, colleges, old temples and a bazar are the chief buildings. Gunpowder, silk, cottongoods and iron are manufactured. A large trade is carried on with Bokhara, Mongolia and the Russian provinces of Orenburg and Petropavlovsk. Tashkend is an important military point and was long coveted by the Russians, who captured it in 1854. Population 155,673. See Vambery's *Travels in Central Asia.*

Tasmania (*tăz-mā'nĭ-ă*), (formerly known as Van Diemen's Land), is an island lying south of Victoria, Australia and separated from it by Bass Strait. It is one of the original states of the Commonwealth of Australia (*q. v.*). The colony is a British possession, and at the beginning of the century was a penal settlement. Transportation of criminals to it ceased in 1853. Its area is 26,385 square miles, including Macquarie, divided into 18 counties. The aborigines are extinct. The capital is Hobart, on the south of the island, with a population of 24,655. The other chief town is Launceston (18,077). The principal occupations are agriculture and stock-raising; wool, wheat, hay and oats being the chief exports. Fruit is successfully cultivated, especially apples and pears, which in size, appearance and variety surpass those of Britain. The climate is healthy and temperate. The island contains tin, coal, gold and silver. Education is unsectarian, and compulsory for all children between seven and fourteen. Government is exercised by a responsible ministry, with a parliament consisting of two chambers. A resident governor represents the crown. Population about 190,000.

Tasso, Torquato (*tăs'sō, tor-kwä'to*), an Italian poet, was born at Sorrento, March 11, 1544. His father, also a poet, lived in exile, and Torquato was brought up by his mother, and went to school to the Jesuits till his tenth year, when he joined his father at Rome. He passed some years in study and in helping his father by copying and correcting, when he left for Padua to study law, where he wrote *Rinaldo*, his first poem, and, after a course of philosophy at Bologna, returned to become a member of a literary academy established by one of his friends. While at the court of Alphonso II, duke of Ferrara, in 1575, Tasso finished his masterpiece, *Jerusalem Delivered*, but rashly sent it to a society of scholars, critics and churchmen at Rome, instead of publishing it at once. Their criticisms drove him to madness. He believed he had been denounced to the Inquisition and one evening in 1577 he drew his dagger to stab a servant, whom he fancied to be one of his secret enemies. He was imprisoned, but escaped to his birthplace, where he recovered his reason. Two visits to Ferrara were followed by two returns of madness, after one of which he suffered an imprisonment of seven years, being set free in 1586. In 1595 the excitement of visiting Rome to be crowned a poet — the same honor which had been bestowed on Petrarch — caused an illness from which he died on April 25. See Milman's *Life of Torquato Tasso.*

Taste, the sense by which such properties of substance as sweet, sour, bitter, salt etc. are distinguished. The principal organ of taste is the tongue, especially its sides, base and tip. The soft palate and the arches of the palate also have the sense of taste. The sense of taste is weakened by any great change in temperature, either of heat or cold, as after holding the tongue in ice-water or in very hot water the taste of sugar will not be noticed. It is necessary that bodies to be tasted should be dissolved, so as to come in contact with

the nerves of taste. Any substance which will not dissolve in the fluids of the mouth will be found to be tasteless, and only recognized by the sense of touch in the tongue. Bitters and acids excite sensations of taste in the most diluted forms. One part of quinine in 1,000,000 parts of water can be easily distinguished from pure water. The sense of smell (*q. v.*) is affected by most substances as well as the sense of taste, and taste and smell together form what is called the flavor. The great use of the sense of taste is to direct in the choice of food, and in the lower animals it is even a surer guide than in man. Usually articles that are agreeable to the taste are desirable for food.

Tattoo'ing, a widespread custom among savages of marking the skin with figures by means of slight cuts or punctures and a coloring matter. It is almost universal in the islands of the Pacific. New Zealanders often cover the whole face and sometimes the chest, arms and other parts of the body with tattoo patterns. A boy is tattooed on entering manhood; the operation causes considerable pain but is born unflinchingly. A bone, edged with teeth, is dipped in a thick mixture of charcoal and water, and hammered through the skin by means of a piece of wood. The marks last for life, and look black on a brown skin, but are dark-blue on the skin of a European or American. Tattooing seems to have been common among the nations with whom the Jews came in contact, as they were forbidden to practice it. The Bedouin Arabs and many tribes of American Indians tattoo, and sailors all over the world print anchors and other marks on their arms.

Tauchnitz (*touk'nits*), **Karl Christoph Traugott,** a famous German printer and bookseller, was born at Grosspardau, near Leipsic, Germany, in 1761. Bred a printer, he began a small printing-business of his own in Leipsic in 1796. Publishing and type-founding were added, and it became one of the largest establishments of the kind in Germany. In 1809 he began to issue classic works in such fine and cheap editions that they circulated throughout Europe. By offering a prize of a ducat for every error pointed out, he brought out a remarkably correct edition of Homer. In 1816 he introduced stereotyping into Germany and applied it to music, an experiment which had not been tried before. The well-known Tauchnitz edition of English authors, which numbers over 3,700 volumes, was begun in 1842 by his nephew. The older Tauchnitz died in 1836.

Taun'ton, Mass., county-seat of Bristol County, on Taunton River, 35 miles south of Boston. The falls of the river furnish water-power for its many factories. Taunton has long been noted for its manufacture of stoves and printing-presses, brick and iron, and its copper-works are the oldest and largest in the United States. Other products are tacks, machinery, firebrick, crucibles, cotton, flannel, silver-plated ware and solid silverware. Taunton River is noted for its herring and shad fishing. There are a public library, Registry Building, Morton Hospital and the state insane asylum. Several ponds, many shade-trees and the green — a public square — help to beautify the place. There also is a fine bronze statue of Robert Treat Paine, a signer of the Declaration of Independence, occupying a conspicuous place, Taunton being Paine's home. Relics are preserved in Historical Hall, a building owned by the Old Colony Historical Society. Taunton has an excellent public-school system and Bristol Academy, located here, was incorporated in 1792. Taunton was settled in 1638 by a company from Taunton, England. It became a city in 1864. The site was known to the Indians as Cohannet. It was King Philip's favorite hunting-ground, and during King Philip's war it was saved from attack by the king's friendship for one of the citizens. Population 36,000.

Tau'rus, a range of mountains in Asia Minor, which forms the water-shed between the waters flowing into the Mediterranean and those flowing into the Black Sea. There are two divisions of the range, the Taurus on the south and the Anti-Taurus running northeast. Snow-covered mountain-tops are numerous, rising above thick forests that everywhere mantle the mountain sides. The highest peak is Arjish Dagh in the Anti-Taurus range (13,100 feet). Other noted peaks are Bulghar Dagh (11,400 feet), Gok Dagh and Ak Dagh, each 9,800 feet. The principal pass between Syria and Asia Minor, called in early times the Cilician Gates, is formed by the valley of the upper Cydnus.

Tax'es are levied on property and persons for the support of a government. In early times rulers often raised revenues by means of property owned by the government or crown or belonging to the king or prince himself. The possessions of subjects were often confiscated outright, fines were imposed, and in Europe for many years crimes were punishable by the payment of a stated sum of money. The Jews paid taxes mainly in the form of the first fruits of their lands and the firstborn of their flocks, and it was the heavy burden of taxation that caused the revolt of the Ten Tribes after the death of Solomon. In Athens a royalty on the products of the mines, import-duties, market-licenses, assessments on wealthy citizens and tribute from dependent nations were some of the ways used for raising money. In Rome, under the republic, to the spoils of conquered nations and their tribute were

added, under the empire, tolls, taxes on grain, on the privilege of Roman citizenship etc. In Europe, under the feudal system, kings were supported by their own lands, and in war claimed the services of their barons and knights at their own expense. Venice, in the middle ages, began the modern system of taxation by taxing land and levying import-duties; but throughout Europe, until the French Revolution and in some cases since, the nobles and clergy were privileged classes and paid no taxes. In many countries of Asia the right of taxation was given or sold to governors of provinces or to the highest bidder, a practice which often resulted in wringing from the people all that they had, which caused widespread misery. In Europe, too, taxes were sometimes farmed out at a lump sum.

In the United States taxes are imposed by the federal, state and municipal governments. Federal taxes are in the form of customs-duties on imports and exc se-duties, mainly on liquors and tobacco. Both import and excise duties are indirect taxes, that is, not paid directly by the consumer. The bulk of state taxes are laid directly on property. The heaviest taxes usually are those laid for local purposes by the county or city. Besides the ordinary city or county taxes, assessments are often made on property specially benefited, for opening streets or roads, for street-lamps, sewers, water-service etc.

Unjust and unfair taxation has often caused discontent and even revolutions, and how to tax without oppressing the people is a deep problem. Turgot the French statesman, called it the art of plucking the goose without making it cry. In most countries it is now recognized that no tax can be levied without the consent of the representatives of the people who have to pay it. It was England's attempt to raise a stamp-duty and a customs-duty on tea in America that caused the revolt of the colonies under the celebrated cry: "No taxation without representation."

Taxidermy (*tăx'ĭ-dĕr'my*), the art of preparing the skins of animals for the purposes of the naturalist. In preparing small animals for stuffing, the skins are removed, the flesh clinging to them is cleaned away, and they are anointed with arsenical soap. This keeps the skin supple and prevents decay and attacks of insects. Larger skins are prepared with a powder containing arsenic, burnt alum, oak-bark and camphor. The animals are then stuffed and mounted.

Taxon'omy, that division of botany which deals with the classification of plants. It is one of the oldest of subjects, and not very long ago it was the only form of botanical instruction given in the schools. Specialists in this study are called taxonomists or systematists, but the plant-kingdom is so vast that no one can be a specialist in the taxonomy of all groups. Accordingly there are algologists, who classify algæ; mycologists, who classify fungi; bryologists, who classify mosses; pteridologists, who classify ferns. Ordinarily, when a man is called a systematist or a taxonomist, without any qualification, he is a specialist in the classification of seed-plants. The early attempts to classify plants were purely artificial, that is, there was no effort to indicate their real relationships. For example, one of the earliest groupings of seed-plants was into herbs, shrubs and trees. This brought together many wholly unrelated plants and kept apart many which are closely related, as unrelated words are brought together in a dictionary by the accident of their first letter. The artificial system was most highly developed by Linnæus, who invented an elaborate scheme on the basis of the number of stamens and pistils in the flower. This scheme was used until quite recently, but it has now been entirely replaced by natural systems. These systems attempt to group plants together which are really related, a family in botany meaning about what the term means among human beings, if one substitutes species for individuals. A natural system of classification can only become perfect when the complete development and structure of every plant are known. Hence such systems are being constantly revised as knowledge increases

Tay, the largest river of Scotland, pours into the German Ocean a greater bulk of water than any other river of Great Britain. The Dochart is the chief feeder of Loch Tay, and from this lake the Tay flows past Dunkeld and Perth, at the mouth of the Earn widening into the Firth of Tay, from three fourths of a mile to a mile wide, and falling into the North Sea about ten miles below Dundee, after a course of 120 miles. It is navigable to Perth, and the tide flows a mile further up. The salmon-fisheries are valuable.

Tay'lor (James) Bayard, American author and traveler, was born at Kennett Square, Pa., on Jan. 11, 1825. At 17 he was apprenticed in a printing-office, and soon began to publish poems in newspapers and magazines. In 1844 he made a walking-tour of Europe, an account of which he published as *Views Afoot*. After writing for several newspapers, he joined the editorial staff of *The New York Tribune*, in which appeared accounts of travels in California, Mexico, up the Nile, in Asia Minor, India, China and Japan. In 1878 he became minister to Germany. Taylor was a quick worker, throwing off many volumes of verse, fiction, sketches, essays, translations and criticisms, besides his 11 books of travel. As an original poet he stands high in the second rank. Some of his best travesties are in his *Echo Club*. Among the finest of his poems are *Bedouin Song*, *The Quaker Widow* and *The*

Old Pennsylvania Farmer. His masterpiece is the translation of Goethe's *Faust*, "one of the glories of American literature" and one of the finest translations in any literature. Perhaps the best of his novels is *The Story of Kennett*, which largely is his own story. Taylor died at Berlin, Dec. 19, 1878. Consult *Life* by Conwell.

Taylor, Jeremy, a great English churchman, was born at Cambridge, Aug. 15, 1613. He was the son of a barber, and graduated at Cambridge University, becoming a clergyman before he was 21. During the Civil War he seems to have followed the royal army, and afterwards withdrew to Wales. Here, buried from the world for 13 years, he kept a school at Newton and employed his leisure in writing the works which gave him fame. Chief among them are *Liberty of Prophesying, Holy Living* and *Holy Dying.* At the Restoration, Taylor, as a stanch Loyalist, was made bishop of Down and Connor, an Irish see. Seven years later, he died on Aug. 13. 1667. See *Life* by R. A. Wilmott.

Taylor, Zachary, twelfth president of the United States, was born in Orange County, Va., Sept. 24, 1784. His father was an officer of the Revolutionary War and one of the first settlers of Louisville, Ky., where Zachary was taken as a boy and lived till his 24th year, working on a plantation and getting but little schooling. Taylor entered the army in 1808 as lieutenant, and in 1812, as captain of a company of 50 men, two thirds of whom were down with fever, he defended Fort Harrison on the Wabash against a large force of Indians, led by Tecumseh (*q. v.*), the famous chief. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of England. He built Fort Jesup in 1822, and ten years later served as colonel in the Black Hawk War. In 1836 he was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brigadier-general and made commander of the United States forces in Florida. Just before the breaking out of the Mexican War Taylor was ordered to Corpus Christi, occupying the point with a force of 4,000 (1845). Next spring he marched across the disputed territory between the Nueces and the Rio Grande, and built Fort Brown opposite Matamoras. The Mexicans demanded that he retire beyond the Nueces, and on his refusal Arista crossed the Rio Grande with a force of 6,000. On May 8, 1846, Taylor defeated him at Palo Alto with 2,300 men, and a few days later drove him from a new position at Resaca de la Palma across the Rio Grande. War was at once declared by Congress; 50,000 volunteers were called for; and Taylor was made a major-general, reenforced, and ordered to invade Mexico. On Sept. 9, with 6,625 men, he attacked Monterey, which was defended by 10,000 regular troops. After ten days' siege and three days' hard fighting it surrendered. All but 5,000 volunteers and 500 regulars of his army were now sent to aid General Scott at Vera Cruz, and Taylor was left with this small force to oppose President Santa Anna's army of 21,000. He took a strong position at Buena Vista, fought a desperate battle and won a decided victory. This victory against enormous odds caused the utmost enthusiasm, and Taylor, known as "Old Rough and Ready." was nominated by the Whigs for the presidency and elected. Entering the White House in 1849, he found a Democratic majority in Congress, with the small but vigorous Free-Soil party holding the balance of power, while such exciting questions as the admission of California, the settlement of the boundaries of Texas and the organization of the newly-acquired Mexican territories were stirring the nation. Worn out by the unaccustomed turmoil of politics, the rough, good-natured soldier did not long enjoy his honors, but died on July 9, 1850, 16 months after his inauguration. See *Lives* by Fry, Montgomery and Stoddard.

ZACHARY TAYLOR

Tea, the prepared leaves of *Thea Chinensis* or the drink made from them. The plant probably is native to India, and was introduced into China and Japan. Tea has for ages been a favorite beverage in China, and now is one of the world's most generally used non-alcoholic drinks. The very best qualities do not bear transporting, and are seldom found outside of the country where grown. In the intense tropical conditions in which the native plants grow they become small trees; but in the colder climate of China and Japan they become bushy, with smaller and tougher leaves. In cultivation the shrub grows to from three to six feet, is branchy, the leaves from two to six inches long. The third year the first crop is obtained. There are three pickings a year; in April a rare quality is obtained from the new leaves, May is the time of the principal picking, and a very inferior grade is obtained from a later harvest. The black and green teas are not derived from different plants, but are the results of the different methods of preparation, the black tea being given long exposure to the air in drying. Enormous quantities of tea are produced in China, Japan, India, Ceylon and Java, but most of it is used by the native populations. Our southern states are well-adapted for varieties of tea, the plant not

requiring a tropical climate, and prior to the Civil War many southerners raised their own tea. In South Carolina commercial tea-raising has met with success, and trials are making in other southern states.

Teachers Col'lege, Columbia University, New York City, was founded in 1880 as an association for teaching home-economies. In 1884 it was reorganized under the name of the Industrial Education Association, with headquarters at 21 University Place. In 1887 it was finally incorporated as the New York College for the Training of Teachers, afterward Teachers College. As early as 1890 it became a part of Columbia University, though it retains its own trustees and administration. In 1894 the present fine site on West 120th St. was occupied. The first president of Teachers College was Nicholas Murray Butler. He was succeeded by Walter L. Hervey, who remained until 1897, when James E. Russell became dean. The college now represents an investment of some five million dollars. A new school of domestic art and science was completed in 1909. The college offers courses in education, anthropology, fine arts, biology, domestic art, domestic science, economics and social science, English, French, German, Greek and Latin, geography, geology, history, kindergarten, manual training, mathematics, music, philosophy, ethics, psychology, physical science and physical education. For admission two years of college or normal-school study are required. The general diploma is conferred upon students who have successfully completed one of the undergraduate courses offered; and a departmental diploma upon those who have studied for particular branches of school-work. The graduate-department is larger than any other in Columbia University, having nearly 700 members in 1909. It offers many courses in education, leading to the higher degrees. Its graduates are usually appointed to university, college, normal-school, secondary and public-school positions; or to school-superintendencies or principalships.

There also are many extension-courses offered, both in the college and in buildings easily accessible.

The college has two observation and practice schools — Horace Mann School and Speyer School. Student-teachers observe classes in Horace Mann School, but do not teach them. Horace Mann School, with about 1,000 pupils, has two kindergartens, seven grammar-grades and a five-year high-school course. The tuition is $75 in the kindergarten, $150 in the primary grades, $200 in the grammar grades and $250 in the high school. The school is on Broadway, from 120th to 121st street, in a building given by Mr. and Mrs. V. Everit Macy.

Speyer School, with about 200 pupils, furnishes opportunity for practice-teaching and experimentation. It is entirely free. It occupies a building at 94 Lawrence Street, the gift of Mr. James Speyer. In the afternoons and evenings the school carries on neighborhood-work. Gymnasium, cooking, sewing and carpentry classes are among the school activities.

Bryson Library of Teachers College supplements the university's library of 400,000 volumes with a special collection of over 40,000 volumes, chiefly upon the subject of education. It is open to students and officers of the university and to public-school teachers in the city.

The college publications include *The Teachers College Record* and *The Teachers College Contributions to Education. The Record* is issued continuously every other month except July. *The Contributions* consist of papers representing original investigations by advanced students or officers, edited by the dean and the college professors in charge of the subject treated. From four to six numbers appear each year.

The college and its schools have a staff of 150 instructors, including many distinguished educators and investigators. It represents a university school of education upon the same footing as the schools of law, medicine and science. The total attendance of the college and its schools (1909) is about 5,800 persons.

Teachers' Institute, a gathering of public school teachers of a state, county or city. An institute is held yearly or oftener, and lasts usually from one to two weeks. Instruction is given by lectures, class-drills etc. in the best methods of teaching and governing schools. Sometimes actual classes of children are taught in the presence of the members of the institute, which is probably the most profitable of the many methods in use. The members of the institute, as well as specially engaged lecturers, take part. Institutes have proved a valuable help to teachers, and have raised the standard of teaching throughout the country. The first institute was held by Henry Barnard, state superintendent of schools in Connecticut, in 1839.

Teach'ing, Method of. Method in teaching depends essentially upon methods of learning. The latter are commonly divided into three classes: the trial-and-error method, imitation and reasoning. All learning aims primarily at doing something which the learner is not able to accomplish by instinct, but must master by experience. The simplest method, that of trial-and-error, consists in trying again and again until finally, largely by accident, the desired result is gained. The experiment usually needs to be repeated many times before the act is thoroughly learned. Then it becomes habitual and practically automatic. This method is almost the sole one with the lower animals, and by it nearly

all the simpler acts of human skill are learned; as grasping, standing, walking etc. If the learner possess intelligence enough to imitate, he can shorten the method of trial-and-error by copying the successful acts of others. Older children acquire the more advanced types of skill by the help of imitation — as piano-playing, tennis, the use of tools etc. Here the trial-and-error method is not abandoned but simply aided. Indeed, many models are successfully imitated only by a number of trial-and-error experiments. The method of reasoning consists, as the name implies, in applying one's knowledge to the solution of a new situation. One stops to think instead of experimenting blindly. This method is usually employed in connection with the other methods, and only by the most intelligent beings.

When mankind endeavors consciously to teach his fellows, his purpose is to shorten and render easier the process of learning by trial-and-error. The simplest methods of doing this consist in presenting a model for imitation or in giving instruction in the method of performing the act. The success of such methods is easily tested when they aim to instruct in some simple act of skill, immediately and constantly useful, as speech, the use of tools etc. When, however, the aim is not so immediately to be realized, but consists, as with most of the school-work of to-day, in equipping the child with knowledge and skill to be applied by him at a time far distant and in the solution of problems the details of which can not be foreseen, the simpler methods of teaching no longer suffice. The divorce between the acquisition of knowledge and skill and the use of them and the wide difference between the conditions under which the child first learns and those in which he applies his learning demand the utmost art of method in order that education may help life and learning lead to practice. The criticisms of old-fashioned school-method may be summed up under two heads. First, it often fails to provide the proper and adequate motive for learning and relies instead on purely school-motives, like rivalry, fear of punishment etc. The true motive is desire to do some work that can not be performed without the knowledge in question. The teacher, however, finds it difficult or impossible to rouse in the child a living sense of the value of what he is called upon to learn, because it is to be used in a later life that the child cannot realize very clearly. Hence artificial motives are used, and the learner finds in the entire school-program something arbitrary that he strives to outwit. The second criticism is that knowledge is imparted, learned and recited in a set form instead of in a variety of conditions. The result is that the student fails to use it in any other connection than that in which it originally appeared. Arithmetic is used to pass school-examinations but not to solve actual business-problems.

The reformers of method have endeavored to meet the first criticism by developing interest (*q. v.*) in the school-work and the second by such devices as will lead the learner to use his knowledge in a variety of conditions. The correlation of subjects (*q. v.*), so that each is made to illuminate others, and the inductive method represent the most important of these devices. The inductive method rests on the notion that the mastery of general concepts, principles or laws is the aim of all instruction. This is because only in such generalized forms can knowledge be applied to new conditions. But in order to master principles it is necessary for the learner to start from the concrete facts upon which these are based and by his own insight discern the generalization involved therein. Only thus can he be relied upon to recognize the principle when the conditions vary. Moreover, he must be practiced in the application of these principles. In accordance with these requirements the so-called "formal steps" have been evolved by Herbart, Ziller, Rein and Charles and Frank McMurry. They constitute what is known as the method of the recitation, and may be described as follows: After the subject of study for the lesson has been announced, the pupils are called upon for what they know concerning it. This constitutes the preparation. After it is finished comes the presentation. Here whatever questions remain unsettled are attacked. They may be answered either in the form of a lecture by the teacher, the study of a textbook or, perhaps partly or even wholly, by the original efforts of the pupils. The latter method is called the method of development. It may be based on direct observation of the facts involved, as in an excursion, a laboratory experiment etc. Presentation is followed by comparison, in which facts similar to those studied are recalled and compared. Then comes the generalization, in which the principle behind the entire class of facts is deduced. Finally, the application insures that this principle shall be employed to explain new cases. The entire treatment may require several lesson-periods and is called a lesson-unit.

This method has been attacked as not providing for all necessary kinds of school-work. It is probable, however, that specific exercises like drill, review etc. are all provided for, especially in the step of application. Professor Dewey suggests that the motive by which interest should be secured comes through the anticipation of the application. To get this motive and the dependent interest, his method is to have the school-room a little society in which living

problems are being continually worked out. For example, the child learns to read because only thus can he get certain information that he needs in the group activity of the school. See APPERCEPTION; CORRELATION; ASSOCIATION OF IDEAS; CHILD-STUDY; EDUCATION, MODERN; INTEREST; MEMORIZING; and MENTAL DISCIPLINE. For analytic and synthetic methods consult *Psychology for Teachers*. Consult *The Method of the Recitation*, McMurry; *Principles of Teaching*, Thorndike Seiler; and *The Educative Process*, Bagley.

Teak, the name of *Tectona grandis*, a member of the verbena family. It is a forest-tree of India, and its timber is prized as by far the most serviceable of all timbers for ship-building. The timber resembles mahogany, and is more durable and much lighter than oak. There also is a teak highly valued for furniture, exquisite carved pieces being offered for sale. The color of the wood is a dark brown.

TEAK

Teal, small ducks belonging to the group of river-ducks. They are abundant in Europe, America and most other parts of the world. There are ten or fifteen kinds in the United States. The two best-known forms are the green-winged and the blue-winged teal. The former is a beautiful little duck, about 14 inches long, abundant during migrations and one of the best ducks as food. It feeds on seeds of grass, small acorns, fallen grapes, water-insects, small snails and worms. The blue-winged teal, with a blue band across the wings, is larger, being about 16 inches long. It is the most numerous of the smaller ducks in the eastern United States. West of the Rocky Mountains it is replaced by the cinnamon teal.

Tech′nical Schools. This term embraces all institutions whose object is to prepare its students directly for some particular career or vocation as opposed to those giving a so-called liberal education. Usually, however, it is restricted to that class of schools especially devoted to the investigation and teaching of industrial and mechanical arts and sciences, as civil, mechanical, mining, electrical, chemical and sanitary engineering, architecture, draughting etc. They usually are institutions of college or university grade, to which the titles of engineering schools, institutes of technology, polytechnic institutes and schools of applied science are variously given. The great majority confer only the degree of bachelor of science at the end of the four years' course and the professional degrees of C.E. and M.E. only after the completion of at least a year's graduate work in residence and three years of successful professional work. They have arisen almost invariably in response to the industrial demands of the district in which they were founded, as, for instance, the Colorado School of Mines. They practically are a development of the last half-century. On the basis of control there are three types of technical schools in the United States: those founded by private individuals and relying for support mainly upon private endowment, as Rensselaer Polytechnic Institute of Troy, N. Y.; those forming a department of some college or university (as the engineering departments of the Universities of Michigan, Pennsylvania etc.) and usually sharing in the common resources of the university of which they form a part; and those supported largely if not entirely by state government expense. The majority of these are connected with some university.

Massachusetts Institute of Technology at Boston perhaps is the most famous technical school in America, but many excellent ones are distributed through the whole country. A few of the most prominent, in addition to those already mentioned, are those connected with Columbia, Harvard, Yale, Cornell, Leland Stanford and California Universities, Worcester Polytechnic Institute, Armour Institute of Chicago, Michigan School of Mines and Case School of Applied Science of Cleveland.

Tecumseh (*tê-kŭm′sĕ*), a famous chief of the Shawnee Indians, was born near the site of Springfield, O., about 1768. Elskwatawa, his brother, the prophet, preached against the use of the white man's liquor and food, and about 1805 Tecumseh tried to gather all the western Indians into a confederacy against the whites. As a result, 400 gathered at Greenville. In 1811, while the chief was away urging the Seminoles and Creeks to rebel, General Harrison marched on his encampment to demand that plunder be given up and that the warriors go back to their tribes. The prophet decided to fight, but was worsted and his prestige among the Indians destroyed in the battle of Tippecanoe. On the outbreak of the War of 1812 Tecumseh led a large force to the support of the British in Canada. He was made a brigadier-general in the English service, and fought bravely in several battles. He was wounded at Maguaga and also while bravely defending a ford on General Proctor's retreat before General Harrison. At the siege of Fort Meigs, where he and Proctor

held joint command, he saved the lives of the American prisoners. At the battle of the Thames in Canada he believed he would be killed. So he laid aside his general's uniform and sword, and, dressed as an Indian warrior, fought desperately till he was shot (Oct. 5, 1813). It is believed that he was killed by Richard Mentor Johnson. See *Life* by Benjamin Drake.

Teeth are structures derived from the skin of the mouth, involving both the epidermis and the dermis. Only those of vertebrated animals need be considered. In fishes and snakes they usually are sharp processes without sockets, arising from bones of the jaws and the mouth-parts. In crocodiles and all mammals they are located in sockets. The teeth always show the habits and food of animals, and, therefore, are much used by naturalists in classification. They are of great importance to the students of fossil life, because they are usually well-preserved on account of their hardness. They have been of great service in tracing the evolution of animal life during geological periods. In the herb-eating animals there have been slow changes in the pattern of the crown of molar teeth, which can be read by students like hieroglyphics. The teeth of mammals contain living pulp on the inside provided with nerves and blood-vessels; this is surrounded by dentine or ivory, a bony substance produced from the dermis. The dentine is covered above the jaws by enamel, which is the hardest substance in the human body. The roots are covered with cement, which joins the enamel and sometimes extends into it. When the enamel is broken or worn through, the much softer dentine is exposed; this decays and leads to cavities in the teeth and to their destruction, if the cavities are not cleaned and filled. The typical number of teeth in mammals is 44, 22 on each jaw, and not 32, as most people suppose, because the latter number is found in man. Teeth of mammals are divided into incisors or cutting-teeth, canines or sharp tearing-teeth, premolars which appear earliest, and molars or grinding-teeth. There usually are two sets which appear in succession, the milk-teeth or temporary ones and the permanent set. The teeth are subject to great modifications. The great cutting-teeth of beavers and the tusks of elephants are modified incisors; the tusks of the walrus and those of the wild boar are enlarged canines. The molars or grinding-teeth have a pattern on the crown that is characteristic of the different groups of mammals.

Tegner (*tĕng'nâr'*), **Esai'as,** a popular Swedish poet, was born at Kyrkerud in 1782. He was graduated and appointed lecturer on æsthetics at the University of Lund. His poem, *Sweden*, which appeared in 1811, brought widespread popularity. Next year he took charge of a parish, besides the chair of Greek in the university, and yet found time to write, among other works, *Axel*, a poetic romance, and his epic, *Frithiof's Saga*, which at once became the most popular poem of Sweden. Its author was at once made bishop of Wexio, sat in the national legislature in the chamber of the clergy, and became noted as a political leader and speaker. When just about to be appointed archbishop, Tegner had an attack of insanity, which he inherited. He recovered his sanity but not his health, and died in 1846. *The Children of the Lord's Supper* has been finely translated into English verse by Longfellow.

Teheran (*tĕ-h'rän'*), capital of Persia, stands 70 miles south of the Caspian Sea, on a wide, stony plain. On the northeast are the Elburz Mountains, the highest peak of which is Demavend, 22,000 feet above the sea. The town is built mainly of mud-houses, packed within a mud-wall 20 feet high and four miles around. The finest building is the bazar of Taki Khan. In the suburbs are the shah's palace, called the ark or citadel, and the castle of the *kajars*, another royal home. In 1849 a polytechnic school was opened with European professors, introducing science and the western languages. Carpets, shoes, hats and linen goods are manufactured. Teheran was unimportant until made the capital of Persia by Aga Mohammed Khan about 1796. Population 280,000.

Tehuantepec (*tā-wän'tā-pĕk'*), an isthmus of Mexico, between the Bay of Campeche on the Gulf of Mexico and the Bay of Tehuantepec on the Pacific Ocean. Its narrowest part is 130 miles wide. It contains lakes, lagoons and Coatzacoalcos and Tehuantepec Rivers. One of the several plans to join the Atlantic and Pacific by a ship-canal proposed crossing this peninsula, in part by deepening and widening Coatzacoalcos River. The Mexican government on Jan. 23, 1907, opened its interoceanic railway (192.42 miles long) from the mouth of the Coatzacoalcos to the Pacific port of Salina Cruz. It saves 10,797 miles from New York to San Francisco through the Straits of Magellan.

Tekeli, Emeric, Count, a celebrated Hungarian patriot, was born in Zips, Hungary, in 1656. His father had taken part in a plot to free Hungary, and after his death Tekeli was forced to flee to Poland. Unable to get possession of his estates, he invaded Hungary, when but 22, at the head of 20,000 men furnished by the prince of Transylvania. He was joined by crowds of his dissatisfied countrymen, made inroads into Austria, Styria and Moravia, and forced Leopold I, the Austrian emperor, to make promises which gained part of

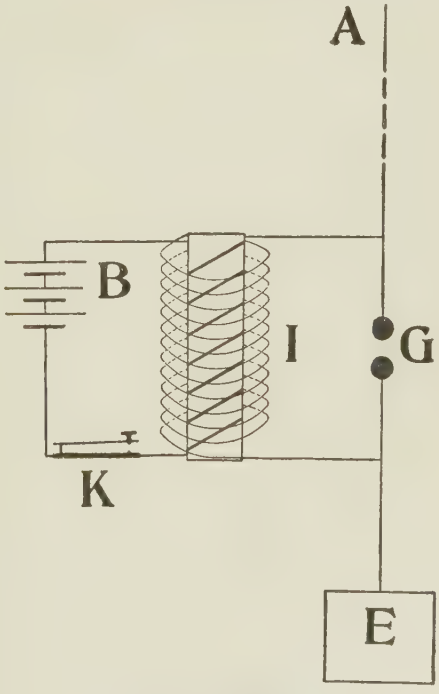
Tekeli's followers. But Tekeli would not trust the emperor and refused to disarm. He was supported by the Turks, who crowned him king of upper Hungary, and he took part in the famous raid of Kara Mustapha into Austria. Soon many of his partisans deserted him, and his friends, the Turks, imprisoned him, but again in 1690 he was at the head of a Turkish force with which he burst into Transylvania, routed the Austrians and roused the Hungarians to renewed efforts for freedom. But several Austrian victories over the Turks forced them to sign a treaty agreeing no longer to support the Hungarian rebels. As a result, Count Tekeli was driven from the country for whose deliverance he had risked everything, and died at Constantinolep in 1705. His wife was a noted beauty, but more noted for her gallant defense of her castle against an army of Austrians.

Telau'tograph, an ingenious instrument invented by Elisha Gray, for reproducing autograph-writing, messages, drawings and sketches in facsimile and transmitting such to places distant many miles apart by means of an electric motor driven by a local battery. The message, at the receiving point, is written on the sketch drawn by pencil on a roll of paper drawn over drums, and so arranged that they can be shipped forward by the operator at intervals, as each line of writing or drawing is finished. The receiving-pen, which is a small glass-tube furnished with writing-fluid by capillary attraction, being controlled by the current-impulses from the transmitting pencil, it follows and reproduces all its movements, which are then electrically transmitted.

Tel'egraph, an instrument for transmitting signals to a distance. Unless otherwise specified the word is generally used to mean the electric telegraph, which is the only one we shall here discuss.

Electric signals appear to have been first transmitted on a commercial scale by Wheatstone and Cooke in England in 1837. At each end of the "line," which consisted of five insulated metallic wires, they placed five galvanometers. Different combinations of deflections to the right and left indicated different letters. (See GALVANOMETER.) Later a single galvanometer was used, different combinations of deflections indicating as before different letters. About the same time S. F. B. Morse (*q. v.*) in America succeeded in perfecting a receiver in which the signals could not only be seen and heard, but were automatically recorded. This is the instrument which was in universal use in the United States until operators learned to read the message by the click of the instrument. Accordingly, for ordinary work a telegraph line is provided at each end with a *battery* for producing an electric current, a *key* for opening and closing the circuit and a small electromagnet, with pivoted armature, the so-called *sounder* or *receiver*. More recently the Wheatstone bridge has been applied to the telegraph line in such a way that two messages may be sent over a line in opposite directions at the same time. This is called the *duplex telegraph*. Edison has invented a method for sending two messages over the same line in the same direction at the same time. This is known as the *diplex telegraph*. By combining these two, four simultaneous messages may be sent. This system is called the *quadruplex telegraph*. Various plans have been suggested for sending even more than four messages at once. This is called the *multiplex telegraph*. Rowland (*q. v.*) perfected a system which will not only transmit six or eight simultaneous messages, but will deliver them printed on a typewriter; and not only so, but the sending instrument of the Rowland telegraph is merely the ordinary keyboard of a typewriter. For details concerning these various systems and concerning the important subject of submarine telegraph, first worked out by Lord Kelvin, the student is referred to the larger treatises.

Teleg'raphy, Wireless, consists in sending and receiving electrical signals between places without the use of connecting wires.



TRANSMITTER

FIG. I. (*I*) induction coil; (*G*) spark gap; (*K*) battery key; (*A*) vertical wire; (*E*) ground.

Possible plans of wireless telegraphy were shown by experiments of John Trowbridge of Harvard University, W. H. Preece of the British Postal Telegraph and others between 1880 and 1890. These earlier attempts used the earth as a conductor or depended upon inducing currents by electromagnetic induction (see ELECTRICITY) between two systems of wires. In 1892 Preece for the British Lighthouse Board used a combination of the induction and conduction methods to reach islands six miles and more from the mainland. He concluded that, though communication across space was thus practical under certain conditions, the apparatus was too cumbrous and costly except for special cases.

The only wireless telegraphy in use now is that based on the electrical researches of James Clerk-Maxwell and Heinrich Hertz, and large credit for developing this is due to Guglielmo Marconi (*q. v.*). Marconi's early experiments in wireless telegraphy, made in 1896, were supported by the British postal authorities and reached about ten miles; by 1899 he had established wireless telegraphy 30 miles across the English Channel; and on Dec. 12, 1901, a signal was received by wireless telegraphy in Newfoundland from Cornwall, England, a distance of 1,800 miles. On Jan. 19, 1903, a wireless message was sent from President Roosevelt to King Edward across the Atlantic between Cape Cod and Cornwall.

Marconi's system is in all principles the carrying out on a large scale of Hertz's electric wave experiment of 1887. Marconi' s transmitter consists (Fig. I) of an induction coil I which produces electric sparks across an air or oil gap G, between two metal balls, when the battery key K is closed. When the balls, wires and other parts, EGA, are of proper size and shape, the electric discharge produces a train of electric waves which go out in all directions with the velocity of light. These electric waves pass through air, wood, dry earth etc., that is, through poor electric conductors, as light passes through glass. They are reflected from metals and other good conductors.

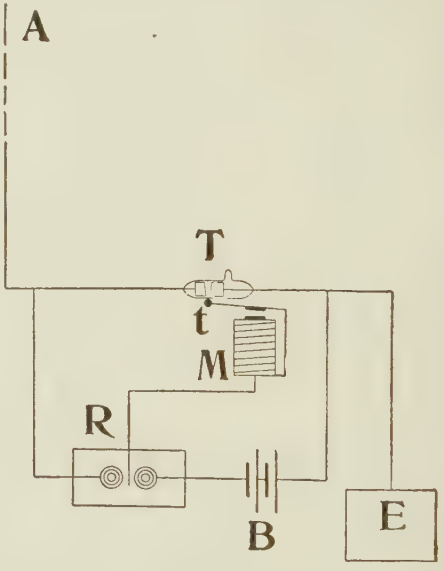
The receiver mostly used at the present time for detecting these electric waves is

COHERER

FIG. II. (*T*) exhausted glass tube; (*PP*) silver terminals separated by metal filings and connected with (*A*) vertical wire and (*E*) ground.

the coherer invented by E. Branly of Paris in 1890. It consists of (Fig. II) a glass-tube T with two silver plugs PP, the plugs being separated by a small quantity of metal filings mostly nickel and silver. The loose filings offer a high resistance to the electric current, but become a fairly good conductor under the action of an electric wave; that is, they cohere. The silver plugs are in a circuit with the usual telegraphic receiving instruments, (Fig. III) a relay R, and a sounder M (or a Morse ink recorder), and a tapper t, for shaking the filings so that the coherer may be ready for the next signal. Each train of electric waves thus closes the circuit through the telegraphic instruments. The ordinary Morse alphabet, made by combinations of long and short signals, is used. (See TELEGRAPH.)

Marconi's great advances have been (1) in showing, as part both of transmitter and of receiver, a high vertical wire or series of wires using towers often 100 feet or more



RECEIVER

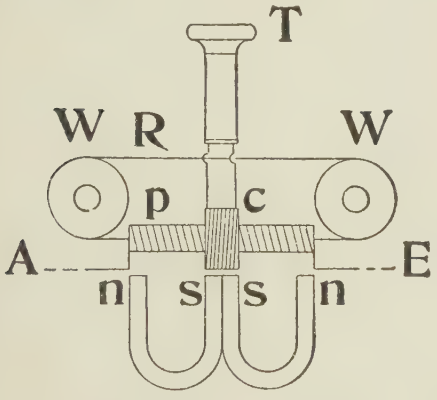
FIG. III. (*T*) coherer; (*A*) vertical wire; (*E*) ground; (*R*) relay; (*M*) sounder or recorder; (*t*) tapper.

high; (2) in increasing the sensitiveness of the coherer far beyond anything known before; (3) in devising and using very powerful discharge-currents.

A defect of wireless telegraphy has been that all receiving-stations within the radius of action of the transmitter receive the electric signals. To overcome this, attempts have been made to tune or make syntonic the transmitting and receiving apparatus, so that receivers will respond only to signals from corresponding transmitters. The method in syntonic telegraphy is to use combinations of coils and condensers or Leyden jars with the discharge-balls and the wave-detector, instead of using the

simpler transmitter and receiver of the earlier experiments. Many patents on this line have been taken out, but no public commercial test of a syntonic system has been satisfactory.

Another defect has been the slowness, largely owing to the necessity of tapping the coherer each time. A number of new wave-detectors have been recently brought into use. Marconi has invented a magnetic receiver, a figure of which is shown (Fig. IV). A steel ribbon is carried over wheels through a coil which is in the circuit AE of the receiver. The magnetic effect of the wave on the steel ribbon is read by sounds in the telephone. The Italian naval apparatus uses a form of mercury coherer; Fessenden uses a thermal receiver; while an electrolytic receiver is used by another inventor. Speeds of from 30 to 40 words per minute are claimed, but good authorities put ordinary speed now attainable as 10 to 12 words per minute. From a commercial standpoint wireless telegraphy is possible but not yet fully developed. For moderate distances it already is fairly reliable.

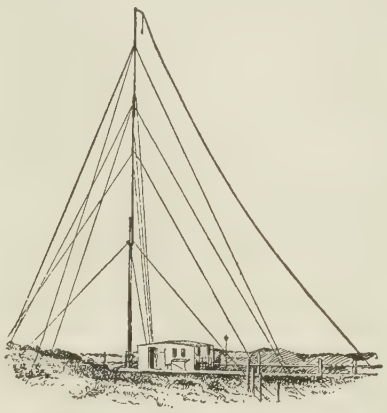


MAGNETIC WAVE-DETECTOR

FIG. IV. (*R*) steel ribbon carried over wheels (*WW*) through coil (*p*) in receiving circuit (*AE*); (*T*) telephone to detect magnetic effects made by wave.

In communicating with and between ships at sea it has proved invaluable. Many of the large Atlantic steamships are equipped with wireless outfits, and often receive messages during a large part of their trip. The Japanese-Russian war showed the advantage and the necessity of wireless telegraphy in naval operations. All United States warships are now equipped with wireless outfits, and the navy department maintains a series of wireless stations at strategic points along the coast. The German military authorities have used it in army maneuvers.

After Marconi the principal inventors in wireless telegraphy are Slaby, Arco and Braun in Germany; Fessenden and De Forest in the United States; and Lodge and Muirhead in England. For the details



WIRELESS TELEGRAPH STATION SHOWING VERTICAL WIRES

of these systems the patent specifications must be consulted.

The leading reference-books are Fahie's *History of Wireless Telegraphy;* Lodge's *Signaling through Space without Wires;* and Turpain's *Ondes Électriques.* But more important are the articles in the electrical journals and the patent-office reports.

Telemachus (*tĕ-lĕm'a-kŭs*), in Greek mythology, the son, by Penelope, of Odysseus or Ulysses, king of Ithaca and hero in the Trojan War, who was noted for his exploits and wanderings. Telemachus, in search of his father, attended by Athené in the guise of Mentor, goes to Pylos and elsewhere, endeavoring to find him. He at last discovers him in the guise of a beggar, when Telemachus was lodging in the house of a shepherd. The king is told how his faithful wife is annoyed by innumerable suitors. Returning to Ithaca both father and son, aided by Athené succeed in slaying these suitors, after which the touching meeting takes place between Odysseus and Penelope. See ULYSSES.

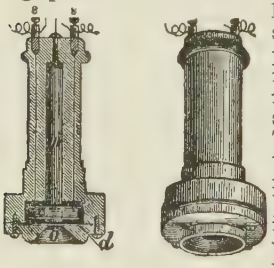
Telem'eter, an instrument for finding the distance of an inaccessible object. In military circles this instrument is generally called a range-finder. Nearly all telemeters are based upon one of two general principles: (1) The image of a distant object, produced by a lens, is geometrically similar to the object itself and depends for its size upon the distance of the object; (2) having chosen a convenient base-line of known length, it is possible by measuring the angle between this base and the direction of the distant object (first at one end of the base-line and then at the other) to compute the distance of the object. A great variety of these instruments have been invented, some adapted to infantry in the field and therefore compact and less accurate, others

adapted to naval operations in which much larger base-lines and hence much greater accuracy can be obtained.

A similar process when employed by surveyors is called stadia-measurement.

Telep'athy, a term used to cover all cases of impression received at a distance without the normal operation of the recognized sense-organs. It is based on the theory that two minds can communicate independently of the physical body. The subject has been so entangled with clairvoyancy and "fake" forms of hypnotism, that much so-called telepathy is unscientific. But it has been scientifically studied since 1882. The mind initiating the process is the agent, and the other mind the percipient. A common form of the experiment is for the agent to draw a geometrical figure on a card and the percipient, who can neither see, hear, taste, touch nor smell what is being done, reproduces the figure. Prof. Crookes suggests that the process may be one of transference of intense thought by inconceivably minute and rapid ether-waves. Other popular manifestations are the performances of test-mediums and apparitions of a person to some distant friend at the time of the person's death. The verdict of science, however, still is: "Not proven."

Tel'ephone, an instrument for reproducing speech at a distance from its source. Perhaps the simplest solution of this problem is to connect two stretched membranes by a stretched string. The pulsations of the human voice near one membrane will set it into vibration; while the string will transmit these vibrations to the second membrane, which by its vibrations reproduces the original sound for a listening ear. This is the so-called mechanical or acoustic telephone; but it is limited to such short distances — less than a mile — that we shall not discuss it.



BELL TELEPHONE

The first electric telephone was undoubtedly invented by Philip Reis in Germany in 1861. To him we owe also the name.

Reis' instrument, like all others of this class, consisted of three parts: one which transmitted the message; the line or wire over which the message was carried; and a receiver which finally transformed the message into sound-waves for the listening ear. His transmitter was very simple, being merely a diaphragm carrying a metallic point which alternately made and broke an electric current when the diaphragm was set in vibration by the human voice. The line was an ordinary metallic wire. The receiver was an electromagnet mounted on a sounding-box. As the iron core of the magnet was alternately magnetized and demagnetized, it emitted a sound — the well-known Page effect, discovered by Dr. Page, an American, in 1837. In this manner Reis was able to transmit the proper *pitch* and *intensity;* but he was totally unable to convey the correct *quality*. (See ACOUSTICS for the three distinguishing features of a sound.) The proper method of transmitting the true quality of a note is the joint discovery of the late Elisha Gray and of Graham Bell.

The essential point in the solution — and, therefore, the essential discovery of these gentlemen — is the use of *continuous* electric currents instead of the *interrupted* ones employed by Reis.

The instrument which Bell patented and perfected, in universal use to-day as a receiver, consists of a soft-iron diaphragm, held by its periphery, in front of an electromagnet. When an electric current, even a very minute one, is passed through the coil of the electromagnet, the iron disk is attracted. If the current is a pulsating one, the disk is set into forced vibration, accurately following the variations of the current.

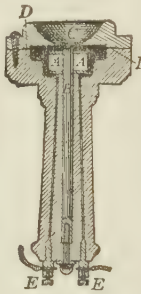


FIG. 1

In figure 1 the diaphragm is shown at D and the electromagnet at A. The line wires which convey the message to the receiver are attached at E.

For a transmitter, a microphone of the carbon type is almost universally employed. Two forms are in very common use: one, the Blake transmitter, is made up of a piece of gas carbon resting against a platinum pin; the other, devised by Henning, consists of a layer of hard carbon granules. The accompanying diagram, figure 2, shows at D the diaphragm which is set in vibration by the human voice. Between the carbon blocks, B and E, are placed the carbon granules

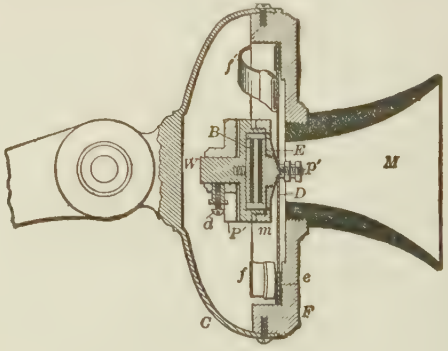


FIG. 2

which act as a microphone. See MICROPHONE.

Telephone lines' construction differs essentially from that of telegraph and of electric-light lines. For this large subject, however, the reader is referred to a special treatise. The attention of the student is called, however, to the recent improvements introduced into submarine telephony by Professor Pupin of Columbia College. Hitherto the maximum working-distance of the telephone for under-water lines has been about 25 miles. Dr. Pupin has extended this to 250 miles. For Pupin's account see *Transactions of the American Institute of Electric Engineers*, Vol. XV (1899) and succeeding volumes.

Tel'ephotog'raphy is a recent improvement on ordinary telegraphy, the advantage of which is to secure an enormous rapidity in the transmission of messages. The invention of the process is due to Anton Pollak and Joseph Virag, two Hungarian scientists. By means of telephotography as many as 150,000 words may under favorable conditions be transmitted per hour. The process does away with "knocking;" and substitutes automatic writing for the slower process of receiving. Fewer operators are needed than under the Morse system, as well as less wire. The message is prepared on an endless strip of paper, so that the writing is represented by five rows of dashes, dots and circles. The currents are transmitted into the receiver along the line by electric branches. The membranes of two telephones in the receiver are agitated and move a mirror, which flashes rays of light so as to photograph the message. The photographs are developed in the machine and automatically cut off when the process is complete.

Tel'escope, an instrument for viewing distant objects, was invented, apparently, by Franz Lippershey, a Dutch spectacle-maker at Middelburg, in 1608. Shortly after this date Galileo heard of Lippershey's instrument and made one for himself. With this instrument he discovered four satellites of Jupiter and the variable phases of Venus, thus completely establishing the heliocentric views of Copernicus. The telescope employed by Galileo essentially was an opera-glass, consisting of a small double-concave (or negative) lens immediately in front of the eye, combined with a double-convex (or positive) lens at some distance in front of the eye. (See OPERA-GLASS). But there are two reasons why the Galilean telescope is no longer used: It has a very limited field, *i. e.*, no large extent of the object can be viewed with it at one time. (2) One cannot use a micrometer eye-piece with it. (See MICROMETER.)

The telescope almost universally employed in modern times is the astronomical telescope made of two converging lenses, as shown in Fig. 1. Let it be borne in mind that the purpose of the telescope is twofold: To gather a large amount of light into a small bundle of rays, so that these can all enter the pupil of the eye and thus make any luminous point appear much brighter than it would to the unaided eye; (2) to magnify the angle subtended by two luminous points and thus make them appear farther apart than when seen by the naked eye. How the first purpose is ac-

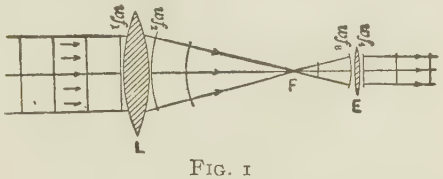


FIG. 1

complished will be evident from Fig. 1, where wf_1 indicates the plane wave-front of the light coming from a distant star. The effect of the object-lens, L, is to convert this parallel bundle of rays into a conical bundle, having its apex or focus at F. The light leaving F is collected by the eye-lens, E, and converted again into a parallel beam, wf_4, which is small enough, say $\frac{1}{6}$ of an inch, to enter the pupil of the eye. In this way nearly all the light which falls on the objective is made to enter the eye, making the star appear much brighter through the telescope than without it. How the second purpose of the telescope is accomplished will be clear from Fig. 2, which is the same as Fig. 1, except that it

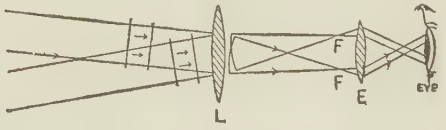


FIG. 2

shows light coming from two distant stars, say a double star. Each star will send a beam of parallel rays to the objective, L. But the two beams of parallel rays which emerge from the eye-lens make a much larger angle with each other than do the two beams of parallel rays which enter the objective. The telescope thus magnifies the angular distance between two stars. Since the human eye cannot distinguish two points as separate unless they subtend an angle of two minutes, the telescope enables us to recognize many stars as double when to the naked eye they appear as single.

The magnifying power of a telescope is numerically equal to the ratio of the diameters of the incident and emergent beams.

The best specimens of the astronomical telescope in existence are the 36-inch glass of Lick Observatory and the 40-inch glass of Yerkes Observatory, both made by the late Alvan G. Clark. On good nights these

instruments permit the use of a magnifying power of from 2,000 to 3,000.

The reflecting telescope is little used and can therefore not be discussed within the limits of this article. Since, however, the reflector is interesting from a historical point of view, the student will do well to consult chapter vi. of Miss Clerke's *History of Astronomy.*

Teleutospore (*tĕ-lū'tō-spōr*) (in plants), a peculiar asexual spore which is developed by the rusts, which are parasitic fungi. Wheat-rust is a common example. The name refers to the fact that these spores are the last spores of the season which appear on the mycelium. As they must endure through the winter, they have very heavy walls and hence they usually are very dark to completely black. Often they are called winter-spores. In wheat-rust the teleutospores form the so-called black rust which appears on the stubble. See ÆCIDIOMYCETES.

Tell, William, according to Swiss story, was a patriot who in the 14th century rescued his native district from the tyranny of Austria. Albert I of Austria was trying to annex the forest-cantons, and was represented there by his bailiff, Gessler, whose rule was very cruel. Among other acts of tyranny Gessler placed the ducal hat of Austria on top of a long pole in the marketplace of Altdorf, and gave orders that no one should pass without uncovering his head. Tell and his little boy one day took no notice of the hat and were dragged before the bailiff. Knowing Tell's reputation as a crossbowman, Gessler ordered him to shoot an apple from his son's head, and told him that if he missed it he should die. To the wonder of all, he hit the apple without injuring the boy. But Gessler noticed a second arrow in the bowman's girdle, and asked what he had meant to do with it. "To have shot you, had I killed my son" was the answer. He was at once seized, but escaped on his way to prison, and soon after shot Gessler through the heart. Then followed the great war of the Swiss against Austria, lasting from 1307 to 1499. Tell is said to have been drowned in 1350 while trying to save a friend during a great flood in Schachen River. In 1387 Tell's chapel was built in his memory. How much of this famous story of Tell is true is not known. Schiller used the story in his drama of *William Tell.*

Tel'ler, Henry Moore, United States senator, lawyer and Republican politician, was born at Granger, Allegany County, N. Y., May 23, 1830, and educated at Rushford Academy and Alfred University (LL.D. 1886). On studying law and being admitted to the bar, he practiced in Illinois, then removed to Colorado, where he was elected to the United States senate, and was secretary of the interior in President Arthur's cabinet (1882-5). Since 1885 he has continued to represent his state in the United States senate, but is now politically a Democrat, having in 1896 withdrawn from the national Republican convention at St. Louis in that year in consequence of the financial plank in its platform adverse to free silver.

Temiskaming, Lake, on upper Ottawa River (Ontario), is attracting much attention. One million acres of excellent arable land have been surveyed and are open for settlement. The district is well watered by Blanche, Montreal and Wabbi Rivers and their tributaries. Thousands of settlers have already taken locations. Temiskaming Railway passes through the district. It runs through the rich silver-deposits of Cobalt (*q. v.*). The town of Cobalt is on the line. Haileybury, only three miles distant and situated on the lake, also is on the railway. The present terminus of the railway (government-owned) is Englehart, 138 miles from North Bay, on White River.

Tempe (*tĕm'pē*), **Vale of,** a narrow valley or gorge, about four and a half miles long, in the northeast of Thessaly, between Mounts Olympus and Ossa. The Peneus flows through it. The classic poets praise it for its matchless beauty, and travelers to-day speak of the wild grandeur of its scenery.

Tem'perance. See TOTAL ABSTINENCE.

Tem'perature. The following statements from Maxwell's classical volume on *The Theory of Heat* put the matter as clearly and concisely as, perhaps, is possible.

"Definition of Temperature.— *The temperature of a body is its thermal state considered with reference to its power of communicating heat to other bodies.*

Definition of Higher and Lower Temperature.—*If, when two bodies are placed in thermal communication, one of the bodies loses heat and the other gains heat, that body which gives out heat is said to have a higher temperature than that which receives heat from it.*

Corollary.— *If, when two bodies are placed in thermal communication, neither of them loses or gains heat, the two bodies are said to have equal temperatures or the same temperature.*

Law of Equal Temperatures.— *Bodies whose temperatures are equal to that of the same body themselves have equal temperatures.*" See THERMOMETER.

Tem'pest, The, a play by Shakespeare, was first acted in 1610. It seems to have been written for private performance, being a third shorter than his average plays. It has been suggested that its present form is an abridgement by Beaumont about 1613, for rendition at the wedding of Princess Elizabeth. It seems to be one of Shakespeare's latest works, first printed in the folio of 1623. Its sources principally are

books of travel. It has no basis in the life of the times. Two characters, Caliban and Ariel, lie outside the bounds of humanity. The drama represents an enchanted world summoned into existence by the magician's wand and ready to disappear at his bidding. There is no strongly dramatic situation. Prospero is in full control; power and right, evenly paired, work together.

Tem'plars, Knights, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th century by Hugues de Paganes, Geoffrey St. Omer and seven other French knights for the protection of the Holy Sepulchre and the pilgrims who visited it. Baldwin II, king of Jerusalem, gave them their first home; and another building was obtained from the abbot of the church and convent of the temple, because of which they were called Templars. Each Templar was allowed three horses and an esquire. They obeyed strict rules, and at first were proud of their poverty. When the Saracens captured Jerusalem, the Templars spread over Europe; their bravery became celebrated everywhere; money and lands were showered on them; and members of the greatest families were proud to be enrolled in their number. In every country where they were they had their governor, called the Master of the Temple.

The Templars at first were all laymen and of noble birth. Pope Alexander III, however, in 1162, had chaplains taken into the order, who did not adopt the military vows; and laymen not of noble birth afterwards joined as serving-brothers, some attending the knights and some working at trades in the houses and on the lands of the order. Many also joined merely to gain the protection afforded them. As the Templars grew in power, they became luxurious, proud and independent of law and authority. Philip IV of France seized and imprisoned all the members of the order on whom he could lay hand, confiscated their lands, and put many to death for alleged crimes. The English Templars were treated by Edward II in much the same manner, except that their punishment was confined to the loss of their possessions to the king. In 1312 the order was finally suppressed by the council of Vienne, the greater part of their property being bestowed on the Knights of St. John.

The Templars' uniform was white, with a red maltese cross on the left shoulder. Their banner was white with black stripes, and was called *beauséant*, the name then given to a horse marked with black and white. *Beauséant* also became their battle-cry. See Addison's *History of the Knights Templars.*

Tem'ple, Tex., a city in Bell County, on the Gulf, Colo. and Santa Fé and the Mo., Kans. and Texas railways, 35 miles southwest of Waco and about 60 north-northeast of Austin. It has a Carnegie Library, and, besides its municipal buildings, churches, and schools, also has the King's Daughters' Hospital and the Railroad Hospital of the Gulf Railroad. Settled in 1881, it was incorporated a city in 1884. Its industries are many and growing; they include flour and cottonseed-oil mills, cotton-gins and compresses, machine-shops, foundries, bottling-works, a cold-storage plant and a candy-factory. It ships extensively of live stock, besides fruit, corn, oats and cotton. Population 7,065.

Temple, Frederick, late Archbishop of Canterbury, was born in Leukas, in the Ionian Isles, in 1821; and died in London shortly after he had performed the ceremony of the coronation of Edward VII. He was a distinguished graduate of Balliol College, Oxford. He was successful in turn as head of the Knellar Hall Training-School, as inspector of schools and as head-master of Rugby. His essay in *Essays and Reviews* was regarded by some as more liberal than orthodox. In 1869 he became Bishop of Exeter, in 1885 Bishop of London and in 1896 Archbishop of Canterbury. Temple was an orthodox prelate, a learned writer and a man of the highest character.

Temple of Kar'nak. The kings of the new empire put all their energy into building temples rather than palaces. The ruins of this period are scattered about Thebes over an area of 2¼ miles north and south and 3½ east and west. The most important and magnificent group is at Karnak on the right side of the Nile. It consists of one principal temple and five or six smaller ones arranged loosely about it, with seemingly little or no regard for symmetry. All the temples of this period were very similar in construction, having an inner sanctuary or *sekos*, a hall of assembly containing two ranges of large columns in the center and one or more rows of smaller ones on the outer side of the central columns. Light was admitted over the lateral columns (this is called a hypostyle hall); sometimes light was admitted over low stone-screens between the columns of the front row of the hypostyle; in such a case all columns were of equal height. In front was a large forecourt, surrounded by a row of columns, at the entrance of which was a double pylon or gate, formed like an oblong, truncated pyramid with flaring cornices, masts and banners and iron stocks for blazing torches in the night. Colossi of seated figures hewn in stone usually decorated the front. The building began with the erection of the *sekos* or sanctuary which was to contain the shrine of the deity and the sacred chamber. Rooms for the priests and the performance of various rites and

ceremonies were adjoining. Karnak is the greatest and most important of all the temple-palaces, for such in reality they were, being built by the king for the worship of the god and also for royal ceremonies and festivities. "The temple of Karnak perhaps is the noblest effort of architectural magnificence ever produced by the hand of man." (J. Fergusson.) Its construction extended over 2,000 years and was the work of 21 kings. It is 1,200 feet long and about 360 in width, the great hypostyle hall being 340 ft. by 170 ft. The sanctuary or inner part was originally built by Osortasen (12th dynasty). Amenophis (the first of the restored race) enclosed it in a greater temple measuring 120 feet square. In front of this Thothmes built a magnificent hall backed by piers and surrounded by colossal statues. Back of it Thothmes III erected a peculiar building in comparison with the rest, 140 feet long and 55 feet wide. It consisted of two rows of massive, square columns which supported the roof on the outer sides while in the center the roof was raised and supported by taller but circular columns with reversed capitals. This is similar to the buildings of Assyria but quite unlike Egyptian ones. The progress of construction was brought to a standstill by the sun-worshippers in the 18th dynasty, but was resumed by Menephthah who started the great hall, "the masterpiece of Thebes." It covered 59,500 square feet, and contained 150 columns 8 to 10 feet in diameter, ending in a capital of flowering lotuses and rich in colored design.

Rhamses I of the 19th dynasty built a small temple in front of this, and the great court was added by the kings of the 22nd dynasty. The building was now complete as we find the plan of the whole in the ruins of to-day. There were 12 entrances to the temple, the most important of which were the one that opened to the boat-landing on the Nile at the northwest and the great gate on the south that gave access from the avenue, which was a mile and a half long and lined on each side with sphinxes, that connected with the temple of Luxor. But this gate was surpassed in grandeur by the former. From the boat-landing on the Nile, a mile distant, an imposing roadway of sphinxes led to the wall of the great court, connected with it by a court containing four obelisks and colossi of the king. The entrance to this was flanked by huge pylons of stone, 180 feet high and decorated with inscriptions, flat designs and sculpture in flat and in high relief. It was painted with brilliant oriental colors. Within this a row of columns led to a second pylon which formed a gateway or entrance to the great hypostyle hall, and was treated in the same manner as the former ones. Avenues of sphinxes led from similar gateways to the surrounding temples. Consult Jas. Fergusson: *History of Architecture;* C. T. Matthews: *The Story of Architecture;* and Perrot and Chipiez: *History of Art in Ancient Egypt.*

Temple of Luxor, The, is next in beauty and importance to Karnak and is in its vicinity. Being built very near the Nile may account for its destruction; yet it may not have been finished. It is ruined, and the materials have been carried away. The utter disregard the Egyptians had for regularity and symmetry is plainly to be seen in this temple. There is a considerable angle in the axis of the whole structure, and right angles in the angles of the court-yards are rare. The columns are irregularly spaced, an irregularity which seems to have vitiated their whole scheme of building. It is 830 feet long, has a width varying from 100 to 200 feet, and is much simpler than Karnak, being built by only two kings, Amenophis III erecting the southern part containing the sanctuary, royal apartments etc., and Rhamses the Great, the northern part, consisting of a large fore-court deflecting from the major axis of the building and facing the temple of Karnak, with which it was connected. A large hall adjoining this and similar to the hypostyle hall at Karnak is attributed to the latter king. The floor of this hall is raised a few feet above that of the court and is reached by a flight of steps. In front of the huge pylon at the entrance of the great court are two colossi of Rhamses the Great, and two obelisks formerly were there also.

Ten'dril, an organ developed by many climbing plants as a holdfast. Tendrils may be modified branches, leaves or parts of leaves. In every case they are very sensitive, and have the power of rapid coiling or contraction when they come in contact with a support. In the grape-vine, when the tendrils reach a support, they coil about it, and growing unequally are thrown into spirals, thus drawing the vine toward the support. Sometimes a tendril has a sucker-like disk at its tip. When the disk becomes fastened to a support, the straight tendril becomes a spiral, and the plant is drawn toward the support. The stimulus which calls forth this response of the tendril is known as the contact stimulus.

Ten'ements. A tenement, properly, is any house constructed for the separate living of more than one family; but the term usually is applied only to the poorer classes of apartment-houses. In our large cities millions dwell in such houses under dreadful conditions. Our country is especially liable to the evil, because deluged with immigrants of a low standard of living and because slow to interfere by laws with the greed and wickedness of individuals. In consequence, while in the rest of the world the densest population occurs in

some parts of Bombay, where 759 Hindus crowd on a single acre, in New York City, in one part, 1,000 men, women and children are herded on one acre. In the worst part of the slums of London the proportion is but 365 to an acre. The time to prevent overcrowding is when the city is building, and suburban lots can be secured with comparative cheapness. The results of such overcrowding are disease, immorality and loss of efficiency, as well as mere misery. During 1894–1903 there were about 500 cases of tuberculosis from one block occupied by 4,000 people. The history of one room shows that, shut out from the healthy action of light, it had given the dreaded disease to family after family. Four times as many children die in these houses as in the average. In Berlin it was found that the death-rate (1885) for families that live in one room was 163 per thousand, but for those that have four rooms or more only 5.4 per thousand. Families living together in one room lose decency, and the children are driven to the streets on hot nights to escape the room. Children grow up with impaired vitality and impoverished minds.

The remedies for such conditions are, first, wise land-laws to keep people from crowding to the towns, advances of money to intending farmers and educating boys and girls to live in the country; second, to improve town-buildings and improve the means of getting from the suburbs to the places of work. England has done much to cheapen suburban travel. London has spent over $10,000,000 to build cottages for workmen and buy and rebuild badly built districts. Glasgow has rebuilt over 83 acres, and thereby reduced the death-rate to a fourth of what it was. The city has repaid itself out of the rents, and improving the public health enriched the public purse. In Berlin the laws are compelling landlords to build decent houses, and make the burden of taxation lightest on houses fit for workingmen. In Belgium the fare on suburban railroads has been reduced to 36c a week for a workman going 20 miles each way, daily. In Italy workmen are encouraged to build their own houses by a remission of taxes for five years on such houses. In New York some bad blocks of tenements have been purchased and turned into parks and playgrounds and schools. Several laws as to tenements have been passed by the state, and New York City has a special department to deal with tenements. Following an English example, Alfred T. White in 1877 put up model dwellings for workingmen, and has received 7½% on his investment. Other attempts of this kind have been made with success. But the immediate relief that would come from holding landlords responsible, from proper inspection and from swift correction of the evils, such as is secured in Berlin, no American city has yet secured. Consult *Charities and Commons*, 1907, especially for May 4 and Sept. 7.

Ten'erife'. See CANARIES.

Teniers (*tĕn'yĕrz*), **David, The Younger,** was born at Antwerp in 1610. His father, also a well-known painter, gave him his first lessons in art. He soon showed a genius, greater than his father's but in the same line, as a colorist and painter of the scenes and incidents of ordinary country-life. He became the most popular of Flemish painters, and was kept busy to meet the demand for his pictures. The governor of the Spanish Netherlands made him gentleman of his bedchamber, and the king of Spain set apart a special gallery for his works. In spite of the number of his paintings — over 1,000 — they bring very high prices. Among them are *The Village Wedding*, *The Bagpipe-Player* and *The Misers*. Teniers died near Brussels, April 25, 1690.

Ten'nessee', the third state admitted into the Union after the adoption of the Federal constitution. Its greatest length is 432 miles, its greatest breadth 109, and it covers 42,050 square miles. It is bounded on the north by Kentucky and Virginia, on the east by North Carolina, on the south by Georgia, Alabama and Mississippi and on the west by the Mississippi. Varying physical conditions divide Tennessee into sections. West Tennessee reaches from the Mississippi to Tennessee River; middle Tennessee stretches eastward to the middle of the Cumberland plateau; and eastern Tennessee covers the rest of the state.

Surface and Resources. The Mississippi bottoms, covering 1,000 square miles, are bordered on the east by a table-land covering 9,000 square miles and reaching to the Tennessee valley. In middle Tennessee, beyond the river-valley, lies the garden of Tennessee, a rich plain of 5,450 square miles, like the bed of a drained lake, surrounded by a rim 300 feet high, filled with grain, cotton and tobacco fields and the largest red-cedar forests in America. There are, all told, 27,300 square miles of woodland. Eastward of the garden is the great Cumberland plateau, 1,000 feet above the Tennessee, rich in coal and limestone. The coal-field covers 4,400 square miles of the Cumberland plateau. There also are lead and zinc mines, marble, kaolin, limestone and granite quarries, phosphate-rock, slate, copper, sandstone, petroleum and iron-ores. The eastern Tennessee valley separates the plateau from the Alleghanies, a belt seven to 28 miles wide including the Chilhowe, Great Smoky, Bald and Unaka ranges. The highest peak is Clingman's Dome (6,660 feet). Among the Cumberland Mountains are caverns many miles long, in which are powerful underground streams and bones of extinct animals. Elsewhere in Tennessee are

mysterious sink-holes, through which the waters drain into underground streams. The chief rivers are the Tennessee, which twice crosses the state, the Cumberland, the Holston, the French Broad and the Big Hatchie.

Occupations. Agriculture is an important industry, and a variety of crops are produced. The leading crop is corn, but tobacco also is important. Other products are wheat, oats, potatoes, sorghum, peanuts and cotton. Fruit-trees and small fruits are grown, and stock-raising is also practiced. The presence of raw materials and the abundance of coal render manufacturing very important. The industries include iron and steel making, foundry and machine-shop products, the preparation of leather and tobacco, flour and lumber mills and the manufacture of textiles, cotton-seed-oil and cake and clay-products. Iron is largely mined, and the pig-iron product is very valuable. Copper is quite extensively produced, and other lines of mining are zinc, lead, phosphate-rock, marble and building-stone.

Education. In several counties education is compulsory, and throughout the state it is illegal to give employment (in factory, mine or workshop) to children under 14. Separate schools are maintained for white and colored. The governor appoints a board of education and the superintendent of public instruction, who also is secretary of the board. There are county and city superintendents besides. There is an enrollment of 502,168 children, and more than 9,000 teachers are employed. The state maintains a normal school, and seven private normals are in operation. The University of Tennessee at Knoxville, opened in 1807; the University of Nashville at Nashville; Grant University at Chattanooga; the University of the South at Sewanee; Vanderbilt University at Nashville, endowed with $1,000,000 by Commodore Vanderbilt; and Fisk University at Nashville, for colored students are among the many colleges where higher education is provided. The state maintains several benevolent institutions, and many are provided by private and ecclesiastical charity.

History. Probably De Soto was the first white man to enter Tennessee. A settlement of North Carolinians, made in 1754, was broken up by the Indians. Two years later Fort Loudon was built on the Tennessee 30 miles from the site of Knoxville. The massacre of the garrison in 1760 was followed within a year by the defeat of the Indians and a treaty allowing settlements to be made. At first a territory of North Carolina, the dissatisfied frontiersmen organized the state of Franklin, which lasted from 1785 to 1788, when it was put down by North Carolina. Tennessee was admitted as a state in 1796. The different capitals have been Knoxville, Kingston, Murfreesboro and Nashville, the present capital. The first railroad was the Memphis Railroad, chartered in 1831, when there were only 50 miles in the country; in 1908 there are 3,576 miles, mostly built since the war. There are 309 miles of electric lines. Tennessee seceded on June 8, 1861, and was readmitted in 1866. Many of the hardest-fought engagements of the war took place on Tennessee soil, as at Forts Henry and Donelson, Island No. 10, Murfreesboro, Chickamauga, Lookout Mountain, Franklin and Nashville. Population 2,172,476. See J. B. Kellebrew's *Resources of Tennessee.*

Tennessee, a river of Tennessee, is one of the largest branches of the Ohio, which it enters at Paducah, Ky. Clinch and Holston Rivers rise in southwestern Virginia, and in eastern Tennessee unite to form the Tennessee. The river first flows south, going 300 miles in Alabama, turns north, and crosses Tennessee and Kentucky. It is 800 miles to the junction of the two rivers at Kingston, Tenn., but 1,100 miles to the source of the Holston, its longest branch.

Tennessee, University of, now at Knoxville, was established in 1794 as Blount College. In 1807 it became East Tennessee College, in 1809 East Tennessee University, in 1879 the University of Tennessee. It is connected with the public schools and is coëducational. The trustees are nominated by the board of trustees and elected for life by the legislature, the governor, however, the secretary and the superintendent of schools being members *ex officio.* The university consists of a college of agriculture and of mechanical arts and of a university department. The college includes agricultural, educational, engineering, industrial and literary departments, their courses being substantially the same as those in other colleges. But the industrial department is for negroes, and is in Knoxville College. The university consists of the academic, educational, legal, medical and dental departments, the last two being at Nashville. Military science and drill are parts of the course, and are required studies for male Freshmen and Sophomores. The agricultural department organizes farmers' institutes, and the university has a farm and the state's agricultural experiment-station. The faculty numbers 115, the students 750, the library 26,000 volumes. The university controls the congressional land-grant of 1862 to Tennessee, and in 1907 its income was $120,990.

Ten'nis, a game of obscure origin, but certainly as old as the 14th century, when it was played chiefly in France. At present the name is applied to lawn-tennis, a modern game that arose about 1875. It is played with rackets and balls on courts of asphalt, cinder, grass or gravel. The court is divided midway by a net three feet high at its cen-

ter and three and a half at the posts that support its ends. The court is 78 by 27 feet in area when two people play, but 78 feet long and 36 wide when four play. The object is for one player on one side of the net to knock the ball into the other players' part of the court in such a way that it cannot be returned. The racket consists of a tightly-strung, flat net of gut; the balls, of rubber thinly covered with white flannel or felt. White lines are traced on the court to indicate the base-lines, each 39 feet from the net; the side-lines 78 feet long, connecting the base-lines; the service-lines, each 21 feet from the net; and the half-court line, half-way between the side-lines, parallel to them and dividing the space on each side of the net into the right court and the left court. So the whole court consists of two half-courts, and these each of a right and a left court. One player takes the ball, stands with one foot on the base-line, the other behind, throws the ball into the air and strikes it in order to drive it, not into the opposite court, but into the court *diagonally* opposite. The other player must hit it on the first bound and return it into the first player's territory. If he does not, the first player, called the server, scores a point which is counted as 15. But if this second player, called the striker-out, return the ball to the server and *he* fail to return it again, the striker-out scores 15. In this way the game goes on under rules of its own, the second point for either player making the score 30, the third 40, and the fourth winning the game, unless *each* player has scored 40. In this case the score is called deuce, and *two* points must be *consecutively* scored for winning the game. When either player has won six games consecutively, a set has been played. But if each has won *five*, the set is deuce and *two* consecutive games must now be won. Serving the ball is done by each player in turn, but courts are exchanged between them only at the end of a set. Three or four players play essentially as do two.

Ten'nyson, Alfred, an English poet, was born at Somersby, Lincolnshire, in 1809. At Trinity College, Cambridge, where he studied, he gained a medal for a poem called *Timbuctoo*. His first publication, *Poems by Two Brothers*, was written in connection with his brother Charles, and so great an authority as Coleridge pronounced only the poems marked C. T. to have marks of poetical genius. A volume containing *The May-Queen*, *Mariana*, *A Dream of Fair Women* and *The Lotus-Eaters*, was followed by another collection, which included *Locksley Hall*, *Morte d'Arthur*, *St. Simon Stylites* and *Ulysses*, and from that time Tennyson easily held his place as the first of modern English poets. His great work, *In Memoriam*, is a series of poems on death, immortality and kindred themes, suggested by the loss of Arthur Hallam, his friend. It was first published without Tennyson's name in 1850. The *Ode on the Death of the Duke of Wellington* and *The Charge of the Light Brigade*, one of his most popular poems, were written as poet-laureate, a position in which he succeeded Wordsworth in November, 1850. *Maud*, published in 1855, was longer in winning public favor than most of Tennyson's work, but the *Idyls of the King* (*q. v.*) met with an enthusiastic reception. The first series consists of four stories in verse: *Enid*, *Vivien*, *Elaine* and *Guinevere*, to which a second series was added which included *The Holy Grail*, *Gareth and Lynette*, *Pelleas and Etarre*, *The Last Tournament* and *The Passing of Arthur*. They are the consummate form into which one of the greatest poets of the 19th century wrought those Arthurian legends which have haunted English romance for 700 years. *Enoch Arden* appeared in 1864; *Queen Mary* in 1875; *Harold* in 1876; *Becket* in 1884; and *Demeter and other Poems* in 1889. Tennyson lived a retired life, spending a large part of his time at his place on the Isle of Wight. He wrote carefully, altering and improving his poems, until they attained the perfect form in which they were given to the public. He received large sums of money for his later work, in some instances being paid as much as $50 a line. His poems have been translated into German and Spanish. In 1883 he was made a peer. He died at Aldworth, in Surrey, England, Oct. 6, 1892. One of his last poems, *Crossing the Bar*, was used in the services at his burial in the poets' corner of Westminster Abbey. Consult Hallam Tennyson's *Alfred, Lord Tennyson;* Stedman's *Victorian Poets* and Frederic Harrison's *Tennyson, Ruskin and Mill.*

LORD TENNYSON

Terence (*tĕr'ĕns*), **Publius Terentius Afer,** a Latin poet, was born at Carthage about 195 B. C. He was a freed slave, and was educated by his master, a Roman senator. His first play, *Andria*, was brought out in 166 B. C., and was so successful that he had the best young men of Rome for friends. When in Greece he translated 108 of Menander's comedies, and his death is commonly thought to have been due to grief at the loss of his translations. He has left six comedies: *The Woman of Andros*, *The Stepmother*, *The Self-Tormentor*, *The*

Eunuch, The Brothers and *Phormio.* The most popular is *The Eunuch.* They have been translated into most European languages. He died in 159 B. C.

Terhune (*tĕr-hūn'*), **Mary Virginia,** American novelist, familiarly known by her pen-name of Marion Harland, was born in Amelia County, Va., Dec. 21, 1831. Her maiden name was Hawes, and in 1856 she married the Rev. Edward Payson Terhune. At an early age she began to write for the magazines, conducting *The Home-Maker* and *Babyhood* and contributing to *Wide-Awake* and *St. Nicholas.* Subsequently she resided in Massachusetts, but finally settled in New Jersey, where she has long been an untiring and helpful writer on themes connected with cooking, household management etc. Among her works are *The Story of Mary Washington, Common Sense in the Household, Common Sense in the Nursery, The Cottage Kitchen, Breakfast, Luncheon and Tea, Some Colonial Homesteads, Literary Hearthstones* and *Marion Harland's Complete Cook-Book.*

"MARION HARLAND"

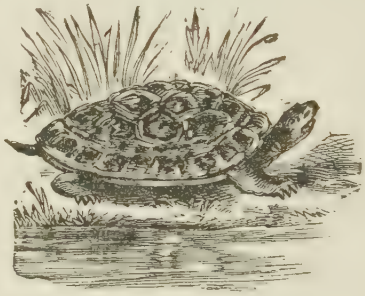
Tern, a water-bird with forked tail, related to the gulls. These beautiful birds, usually with gray and white plumage, are common in harbors. They are most graceful birds, and it is to be regretted that of late years they have been killed in immense numbers for trimming ladies' hats. There are about 50 known species of terns. They are coast-birds rather than open-sea birds, like the gulls. The common tern or sea-swallow is abundant on the Atlantic coast. It is about 15 inches long. There are a small black tern in the inland waters of North America and a similar form in Europe. See Gull.

TERN

Ter'ra-Cot'ta, unglazed, earthen ware, made of clay and hardened by burning. It generally is a dull red or buff in color. In England the materials used are clay, fine quartz-sand and finely pulverized, old pottery. It is used for statues, fonts, fountains, drain-tiles and ornaments for houses. The Greeks, Romans, Assyrians and Babylonians used it, manufacturing molds, statuary, vases and lamps. Often the articles were ornamented with designs of men, animals, fruits or flowers.

Terra del Fuego. See Tierra del Fuego.

Ter'rapin, the name broadly applied to small turtles belonging to a family of pond-turtles (*Emydidæ*). It is frequently restricted to the salt-marsh terrapin or diamond-back turtle of the Atlantic coast, which is highly prized as food. The region whence the diamond-back terrapin is chiefly taken is Maryland, although it is captured from New York to Texas. It is caught in great numbers in the summer and kept in pens for winter. It is about eight inches long; swims well; and runs well on land. The red-bellied terrapin, ranging from New York to Virginia, is often substituted, but the flesh is of inferior quality.



TERRAPIN

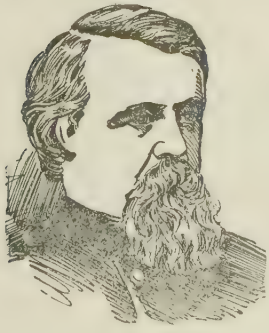
Terre Haute (*tĕr're hōt'*), **Ind.,** county-seat of Vigo County, is upon the east bank of Wabash River on Fort Harrison prairie. It is 73 miles west of Indianapolis and almost equidistant (175 miles) from Cincinnati, Chicago and St. Louis. The town was laid out in 1816 and has since had a steady growth. Its principal buildings are Indiana Normal School, with over 1,000 students, Rose Polytechnic Institute and the high school, with 700 students. There are 20 public-school buildings, two of which, recently built, are models, costing over $35,000 each; also two commercial colleges well attended. There are nearly 200 teachers and about 7,500 children attending school. There are several miles of paved streets and 25 miles of electric car-line. The streets are well-lighted by electricity, and many fine business blocks and private residences line the avenues. The manufacture of glass is one of the principal industries. The great coal-beds underneath furnish a quality of coal from which producer-gas is made, which is cheaper and better than natural gas for manufacturing purposes. Among many other industries which exceed $30,000,000

in yearly value, may be named rolling-mills, stamping-works, car-shops, wagon, tool, brick and tile works, hominy and flour mills and several distilleries, which are among the largest in the country. Population over 40,000.

Ter'rell, Tex., an important city of Kaufman County, is 32 miles from Dallas, in a fine agricultural section. Among its industries are a cotton-oil mill, cotton-gins, a cotton-compress, flouring-mill, creamery, grain-elevator, iron and brass foundry, brick-works and the shops of the Texas Midland Railroad. Terrell has fine school-buildings, thorough course of study and North Texas University School (Meth. Epis.). It has good public buildings and several churches and North Texas Hospital for the Insane. It has all the facilities of a modern city, the service of two railroads and a population of 8,000.

Ter'rier (Latin *terra*, the earth; French, *terrier*, a burrow), a small, unsually shaggy-haired dog, but of many varieties. It is kept and bred by dog-fanciers, either as a pet or to kill rats and other vermin in their burrows or holes in the earth. The chief breeds are the Skye, Dandie Dinmont, fox and other Scotch varieties; the English bull-terrier, black and tan, the Airedale, Bedlington, Welsh and Irish breeds, besides the Boston terrier etc. In height the terrier stands from eight to 16 inches (the hairy Scottish kinds being generally low in stature), with a weight from 14 to 24 lbs. or, in the case of the heavy bull-terrier, with a weight of 50 or more pounds. The Maltese is another variety, of the lap-dog species. See among other authorities F. T. Barton's *Terriers, their Points and Management*, London, 1907.

Ter'ry, Alfred Howe, an American soldier and general, was born at Hartford, Conn., Nov. 10, 1827, and died at New Haven, Conn., Dec. 16, 1890. After studying and practicing law he became colonel of a militia regiment in Connecticut, and on the outbreak of the Civil War his regiment was mustered into the United States service and took part in the first battle of Bull Run. Colonel Terry was present at the capture of Port Royal, at the siege of Fort Pulaski and in the operations against Charleston. He was promoted to brigadier-general, shared in the capture of Fort Wagner, and acted in Virginia in 1864 as division and corps commander. He served at Drury's Bluff, at Bermuda Hundred, at the siege of Petersburg, but his chief achievement as a soldier was his assault and capture of Fort Fisher (Jan. 15, 1865). After this he served under Sherman as corps-commander, and was at the capture of Wilmington. He was brevetted major-general in the regular army in 1865, and commanded the departments of Dakota and the south, and was in charge of successful expeditions against Sitting Bull and the Sioux.



GENERAL TERRY

Terry, Ellen (Alice) [Mrs. E. A. Wardell], an English actress, was born at Coventry, Feb. 27, 1848, and made her first appearance on the stage with Charles Kean's Shakespearian revivals, in 1858, in *The Winter's Tale* and as Prince Arthur in *King John*. She subsequently joined a Bristol company, of which Mrs. Kendal was a member, and appeared in London in 1863 as Gertrude in *The Little Treasure*, as Hero in *Much Ado About Nothing* and as Mary Meredith in *Our American Cousin*. After her marriage she retired from the stage for a while, but in 1867 reappeared, and later joined Mr. and Mrs. Bancroft's company, acting the part of Portia and touring with Sir Henry Irving as leading lady of his troupe. Her impersonations include Viola in *Twelfth Night*, Ruth Meadows in *Eugene Aram*, Henrietta Maria in *Charles I*, Marguerite in W. G. Will's play of *Faust*, Rosamond in *Becket*, Lucy Ashton in *Ravenswood*, Lady Macbeth in Shakespeare's tragedy of *Macbeth* and others yet. In her repeated American tours she has won deserved praise, and is a welcome favorite of the modern stage.

ELLEN TERRY

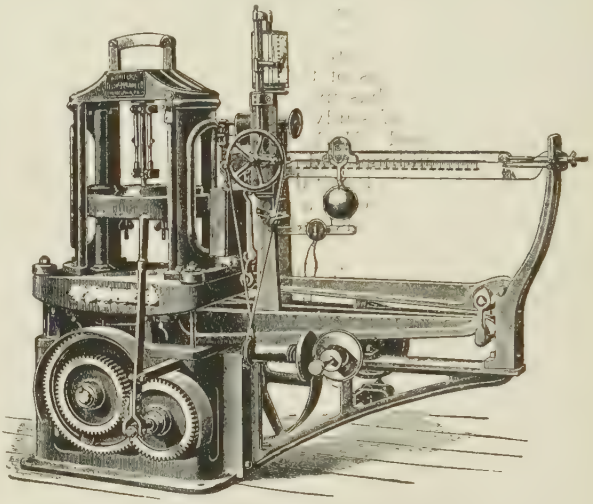
Tes'la, Nikola, electrician, physicist and inventor, was born in Austria-Hungary in 1857, and studied at the polytechnic school at Gratz, the capital of Styria. For a time he was in the government telegraph engineering service, and in 1881 was employed at Paris in one of the large electric lighting companies of that city. In these employments he devoted himself to experiments in

NIKOLA TESLA

electricity and magnetism. On coming to the United States in 1884, he for a time was in the Edison works at Orange, N. J., but afterwards became electrician in the Tesla Electric-Light Company, and established a laboratory at New York for independent research. He is the inventor of the modern principle of the rotary magnetic field embodied in the apparatus used in the transmission of power from Niagara Falls; of new forms of dynamos, transformers, induction-coils, condensers, arc and incandescent lamps; and of the oscillator combining steam engine and dynamo. His researches in electrical oscillation have created a new field of electrical investigation; while he has made many startling innovations and inventions in using currents of high tension. He continues to reside in New York.

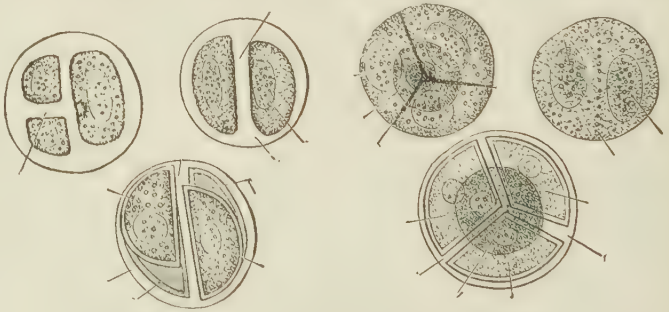
Tes'ta, the seed-coat, which usually is hard and bony. The *testa* is developed by the tissue of the integument of the ovule. Sometimes it develops into two very distinct layers, an outer fleshy layer and an inner hard one. Often it is variously marked and sculptured on the surface, enabling one to recognize the plant from which it has come. In fact, the color and markings of the *testa* are very important guides in the classification of many plants. It is the *testa* also which develops the various tufts of hairs and wings, which are often found on seeds and aid their dispersal by the wind. It sometimes develops hooks and spines, as grappling appendages, to aid in dispersal by animals.

Test'ing-Machine, a machine for testing materials. Testing-machines are arranged so as to apply measured forces to a sample of the material and to observe the corresponding deformation or breaking of the sample. The common tests are stretching, crushing, bending and tension. It is usual to apply the force either by a system of levers or by means of a hydraulic press. The forces are usually measured by a scale-beam. When large samples are to be tested, as long, heavy beams, the machine must be very large. The largest and finest testing-machine ever constructed is that at the Watertown arsenal, belonging to the United States government. It can exert a force of 450 tons, and yet it is extremely sensitive. At the time of its trial a rod of iron five inches in diameter was broken with a measured force of 722,000 pounds and immediately afterward a horse-hair was broken with a measured force of one pound. For loads of 200 pounds it is sensitive to less than one two-millionth of the whole. Testing-machines have so many special forms and appliances that special treatises must be consulted for details. See Unwin's *Materials of Construction.*



AN AMERICAN TESTING-MACHINE

Tetrad (*tĕt'răd*) (in plants). In most of the higher plants each mother-cell organizes four asexual spores within itself. This group of four is called a tetrad. These four sister-spores cling together for a time, and sometimes always, but generally they soon separate from one another. For example, if a very young anther be sectioned and examined under the microscope, each spore-bearing cell (mother-cell) within it will be seen to contain just four forming pollen-grains. This tetrad formation of asexual spores is almost without exception from mosses to seed-plants.



A MOTHER-CELL ORGANIZING FOUR SPORES WITHIN ITSELF (A TETRAD).

Tet'raspore (in plants), the asexual spore of red algæ. It is so named because each

sporangium produces just four spores. See RHODOPHYCEÆ.

Teu'tones, a tribe of ancient Germany living on the Baltic Sea. They were a powerful tribe, and with their neighbors, the Cimbri, invaded the Roman republic near the close of the 2d century B. C., and were almost destroyed by Marius (102 B. C.) The name is now given to all ancient German races.

Tex'arkan'a, Ark., and **Tex.,** two neighboring cities on the boundary between Arkansas and Texas, one in Bowie County, Tex., the other in Millie County, Ark., on the Texas and Pacific; St. Louis, Iron Mt. and Southern; Kans. City, Pittsburg and Gulf; and St. Louis Southwestern railways, 64 miles north northwest of Shreveport, La., and 144 southwest of Little Rock, Ark. The two cities, though adjoining and on the same railroads, have distinct municipal governments, and each has a large trade in cotton, cottonseed-oil, sewer-piping and lumber. The industrial plants of the combined cities embrace railway-shops, furniture and pottery works and lumber-mills. The local post-office is on the state-line between the two towns, while there are two city-halls and public offices, and each has its own school organizations. Combined population about 20,000.

Tex'as, the largest state in the Union, is four times as large as New England, larger than France, Germany or Austria, and equal to six New Yorks or seven Ohios. Its greatest length is 825 miles; its greatest breadth 740; and its area 265, 780 square miles. If the whole population of the American republic were to be carried to Texas, it would be no more densely settled than Massachusetts is now. Population 3,536,618.

Topography. The coast is 375 miles long, in the shape of a crescent, fronted by lines of long islands of white sand, with the Gulf of Mexico on one side and deep and navigable bayous and lagoons on the other, reaching up among the cotton and sugar plantations. There are only four harbors with lighthouses in this long stretch of coast; the United States government has spent many millions in building jetties at Galveston, Sabine Pass, Aransas Pass and other places. In the southwest Padre Island runs northward from the mouth of the Rio Grande for 100 miles; and inside it (between Padre Island and the Texas coast) is *Laguna de Madre*, 90 miles long and eight wide. This lagoon is so salt that fish die on entering it, and on its shores lie the deposits which furnish most of the salt used in Texas. Most of the Texan rivers fall into the Gulf of Mexico, among them the Rio Grande, Brazos, Colorado, Sabine, Trinity, Nueces, San Antonio and Guadalupe. Three rivers form parts of the state's boundary — the Rio Grande, Red and Sabine. The main branch of the Rio Grande is the Pecos. Between the Rio Pecos and the Rio Grande are the Guadalupe, Charrote and other mountains, in whose valleys the rivers die and vanish and the bitter salt-lakes are the only water.

Resources. The resources are numerous, and vary in the different sections. Inland from the coastal plains stretch the midlands, some 200 miles wide. The region called eastern Texas, from 96° W. to Louisiana, covers 50,000 miles, with great forests of pine, oak, cypress, magnolia etc. The rich black prairies reach from Laredo to Denison, a belt from 30 to 60 miles wide. Western Texas lies between Colorado and Nueces Rivers, a bare rolling-prairie of 50,000 square miles, mainly occupied by cattle and sheep ranches. Much like it is southwestern Texas, a tract of 30,000 square miles, between the Nueces, the Rio Grande and the Rio Pecos. The Pan-Handle lies between Oklahoma and New Mexico, mainly north of Prairie-Dog-Town River, with 27,000 square miles of land. It is a plain from 2,500 to 4,000 feet high, with some good soil but little water. The staked plain, which enters from New Mexico, is a waterless, grassy table-land. There are famous gold and silver mines beyond the Pecos. The deposits of building-stone contain marble, granite, soapstone and limestone. Coal, copper, salt, gypsum, lignite, cinnabar, sulphur, iron and asphalt are found. Mineral springs exist in several sections, those of Mineral Wells and Sulphur Texas being best known at present. The state has excellent oyster and other fisheries, and petroleum and natural gas are found.

Occupations. Much iron-ore is mined in eastern Texas, and the coal-mines of the state, though not extensively operated, yield over 1,000,000 tons annually. Salt, silver and gold are also mined, and yellow-pine lumber is cut from the eastern forests, as well as ash, gum, oak etc. Building-stone and cinnabar are quarried, and petroleum produced to the extent of 12,567,897 bbls. annually. Farming and ranching occupy many of the people, and beef, cotton, wool, cotton-seed, hides, corn, oats, wheat, sugar, rice, tobacco, vegetables and fruits are grown. Texas leads all states in the production of cotton, and as a rice-producer is second only to Louisiana. There is a great livestock industry, including cattle, horses, mules and swine. The wool-clip is very valuable. Manufactures are young, but there are over 5,000 specified manufacturing establishments. These include flour, cotton-seed-oil and cake, meat-packing, oil-refining, cigar and tobacco factories, clay-products, foundry and machine work, rice-cleaning, brewing, saddlery and railway-cars.

Education. The Texas school-fund is worth $100,000,000, and in 1906 733,467 children attended the public schools, and

16,146 teachers were employed. There are many high schools and academies and several colleges, the most important being the University of Texas at Austin, which has an endowment of $5,000,000; Henry College at Campbell; Fort Worth University (M. E.) at Fort Worth; Ft. Worth Polytechnic (M. E. So.); Baylor University at Waco, founded by the Baptists in 1845; St. Edwards' College (R. C.) at Austin; and the Agricultural and Mechanical College of Texas at Bryan, endowed by the United States government. The state has four public normals for white people and Prairie View State College (normal and industrial) for colored citizens. Separate schools are maintained for the races, and educational affairs are under the supervision of a state board of education, a state superintendent and county superintendents.

Charities. There are three state schools for the deaf or blind, three insane asylums, a state orphan's home, an epileptic colony and a Confederate Soldier's Home. The state's penitentiaries are at Rusk and Huntsville; a reformatory for boys at Gatesville.

Irrigation. Irrigation in some sections of the arid portions of the state is a very old agricultural aid. The valley of the Rio Grande has many canals for this purpose that have remained almost unchanged to this day. Since 1900 large canal-systems take water from the Brazos, Trinity, Colorado, Guadalupe and other streams to the rice-fields of southern Texas. Numerous small farms are irrigated from surface-wells, and the irrigation-systems of Colorado and Brazos Rivers are worthy of mention. Orchard-fruits, small fruits, grain and forage-crops have been satisfactorily produced in these localities. The soil wherever irrigated yields abundantly, and is adapted in different sections either to agricultural or subtropical products. (See IRRIGATION.)

Government and Cities. The governor and other officers are chosen every two years; the legislature is made up of the senate and house of representatives. The state capitol at Austin (population 33,000), is the largest in the Union. The land-office still controls 5,000,000 acres of public lands. Texas has 12,058 miles of railway and 446 miles of electric lines. The chief cities are San Antonio (93,035), Houston (79,464), Dallas (85,000), Galveston (37,789) and Fort Worth (68,137). Galveston, the chief seaport, was visited by a most destructive hurricane on Sept. 8, 1900. The loss of life entailed by the hurricane was close upon 3,000, while property to the value of about $25,000,000 was destroyed. (See GALVESTON.)

History. The Spaniards explored Texas at a very early date. La Salle in 1685 founded Fort St. Louis on Lavaca River. But sickness and the Indian tomahawk blotted out the settlement, and the country was claimed and held by the Spaniards, who founded the missions of Dolores, San Antonio and San Agostino. Indian raids and rebellions, followed by massacres, made Texas a desert, and to people it Mexico invited American colonists in 1820, and within a few years 20,000 had settled there. Many annoynig acts by the officials of Coahuila, of which Texas was a part, resulted in the Americans sending General Austin to ask that Texas be admitted as a state of the Mexican Union. He was thrown into prison, and troops sent to Texas. In 1835 the Texans rose *en masse*, drove out the Mexicans after hard fighting, and proclaimed a republic. The cruel massacre of the garrison of the Alamo (*q. v.*) by President Santa Anna was followed by his overwhelming defeat at San Jacinto by General Houston. The independence of Texas was acknowledged by the United States in 1839. In 1845 it was annexed to the American Union. At once a dispute with Mexico arose over the southern boundary, Mexico claiming to the Nueces, the United States to the Rio Grande. The result of the Mexican War fixed the southern boundary of the United States at the Rio Grande, and the sale by Texas to the United States of lands to the north and west for $10,000,000 settled the detail of the state's boundary as it is to-day. It was also given the right to divide into five states, if its future growth should require it. The state seceded in February, 1861, and was readmitted to the Union in 1870. The name of Texas means Friends and was that of the Indians first living there, whom the Spaniards called *Tejas* or *Tecas*. The nickname of The Lone Star State comes from the flag of the republic of Texas, a white ground with an azure star. See Bancroft's *History of Texas*.

Texas, University of, is at Austin, but its medical department is at Galveston. In 1839 the Texan republic took the first step to establishing this university, in 1858 the legislature of the state provided for organizing it, and in 1876 the constitution appropriated 1,000,000 acres to it. Incorporation came in 1881, and it opened in 1883, when 1,000,000 acres more were given. It is the crown of the Texan school-system, and is coëducational. It is governed by regents appointed by the governor, two every two years, for terms of eight years, the state senate confirming the nominations. It includes the departments of literature, science and arts; engineering; law; medicine (including a pharmaceutical school); and summer-schools. It has also had charge of the Texan mineral survey since 1901. The faculty numbers 140, the students 2,290, the library 60,000 volumes. The productive funds amount to $2,000,000, and the income in 1907 was $279,387.

Thack'eray, William Makepeace, a great novelist of England, was born at Calcutta, India, in 1811. His father was in the civil service of the East India Company, and dying young left his son a fortune of $100,000. When William was seven, he was sent to England and placed in the noted Charterhouse School, often mentioned in his books. He next went to Cambridge, and in 1831 was at Weimar, where he saw Goethe. His ambition was to become an artist, and he traveled over most of Europe, studying at Paris and at Rome. His drawings were quaint, picturesque and truthful; his art may be seen in the illustrations of his novels, which, as he expressed it, were "illuminated by the author's own candles." But his success in this line did not satisfy him and he tried his hand at writing, much to the delight of readers then and now. He first wrote for *Fraser's Magazine*, in which appeared *The Great Hoggarty Diamond* and *Barry Lyndon*. Most of his capital had been spent in foreign travel and losing investments; he now adopted literature as a profession. His *Snob Papers* and *Jeames's Diary* in *Punch* made him known, but his reputation as one of the greatest of English novelists was made by *Vanity Fair* (1846-8), which disputes the first place among English stories with such books as *Ivanhoe*, *Adam Bede*, *Tom Jones* and *David Copperfield*. In 1849 he published *Pendennis*, one of the best of his books, which tells his own story. His lectures on *English Humorists* and on *The Four Georges* were delivered in America as well as in England. In 1852-5 appeared *Henry Esmond* and *The Newcomes*, his finest works. He also wrote *The Virginians*, a sequel to *Henry Esmond*, in which Washington figures. In 1859 he became the first editor of *Cornhill Magazine*. Thackeray was tall and powerfully built, with massive head, and, as he aged, silvery white hair. He died at London, Dec. 24, 1863. See *Life* by Trollope.

WILLIAM MAKEPEACE THACKERAY

Thales (*thā'lēz*). Greek sage and philosopher, was born at Miletus, Asia Minor, about 640 B. C. and died about 546. One of the Seven Wise Men (*q. v.*) of Greece, he was noted especially as an astronomer and geometer and was the earliest of the Ionian natural philosophers, regarding water as the principle of all things. A remarkable fact concerning Thales is his predicting, so early in the history of astronomical science, an eclipse of the sun, which is alleged to have occurred on May 28, 585 B. C., though doubted on the ground that in Thales' era certain astronomical facts necessary to predict an eclipse with any chance of success were not then known. Some modern astronomers have, however, stated that the prediction of Thales did come true on the date given, and the date agrees with that given by Pliny the Elder in his *Natural History*.

Thallium (*thăl'lĭ-ŭm*), a metal discovered in London in 1861 by the use of the spectrum. It is found in certain iron and copper pyrites, of which it forms about a four-thousandth part, and some in mica. It is generally obtained from the fine dust of pyrites burners. It resembles lead in appearance, is very soft, can be hammered into leaves, tarnishes quickly, gives a green color to a flame, and forms many compounds.

Thallophytes (*thăl'lō-fīts*), the lowest of the four great divisions of the plant kingdom. The name means thallus-plants, the thallus being the characteristic plant-body, which is usually prostrate and has no differentiation of nutritive organs, as the roots, stems and leaves of higher plants. All parts of this body are practically alike. There are two great general divisions of the group: (1) *Algæ*, which contain chlorophyll and hence can manufacture their own food and live independent of any other organisms; and (2) *Fungi*, which do not contain chlorophyll and hence are dependent upon other organisms for their food. Besides the ordinary algæ and fungi the thallophytes contain many forms which are not classified easily, as slime-moulds, bacteria, diatoms etc. The group is an immense one, and contains the minutest of living forms, as well as some which are very bulky, as some of the seaweeds. Thallophytes are of special interest as representing the beginnings of the plant-kingdom, the group from which all the higher forms have been derived.

Thal'lus, the characteristic plant-body of the thallophytes. The thallus-body is also characteristic of the liverworts and of the gametophyte of ferns.

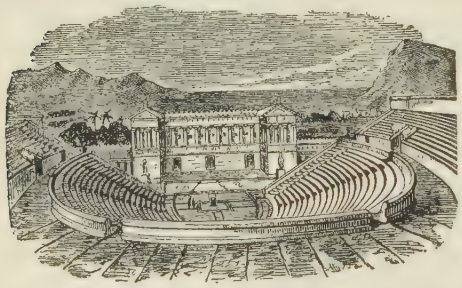
Thames (*tĕmz*), a river of England rising in Cotswold Hills and flowing to the North Sea. It is about 220 miles long, and as far as London, 60 miles from its mouth, is navigable for large vessels. It is 18 miles wide at its mouth, and the tide flows up for 72 miles. The largest river of England, it also is the most important, having as large a traffic, probably, as any river in the world. Its bridges and tunnels at London, its great docks and embankments, are a part of the sights of the city. Canals connect it with the Avon and the Severn, the Sussex coast and the canal system of central England.

Thanks'giving Day, a religious festival peculiar to the United States, resembling the Hebrew feast of ingathering. The

Plymouth colony celebrated the first thanksgiving day after the harvest in 1621, four young men being sent out hunting to make provision for the feast. Such days were appointed after this at different intervals and for various objects in New England and New York. Congress recommended a thanksgiving day yearly during the Revolutionary War, but from 1784 to 1789 there was no national appointment of the festival. In 1784 a day of thanksgiving for the adoption of the Constitution was recommended, and one in 1796 because of the suppression of a riot. For years the festival was almost exclusively a New England institution, celebrated by religious services in the churches, the sermon being often a political address, and by the gathering at the old home of the scattered members of the family. The day gradually became a custom in the western and some of the southern states, each appointing its own day. During the Civil War proclamations for public thanksgiving were issued in 1862, 1863 and 1864, and since that time the day has been regularly appointed by the president of the United States. It usually is observed on the last Thursday in November.

Thayer (*thâr*), **Abbott Handerson,** an American artist, was born at Boston in 1849. He studied chiefly under Gérôme at Paris. His subjects are animals, genre and landscapes, but he has done some wall-painting.

The'ater. The first theater in Greece, the birthplace of the drama, is said to have been



THEATER OF SEGESTA, SICILY — RESTORED

a wagon. The plays of Æschylus were represented on a wooden scaffold. About 500 B. C. one of these scaffolds gave way, and the inventive Athenians at once set about building the famous stone theater of Dionysus. Similar theaters were built in every Greek city, and the ruins of many may be seen to-day. The largest is at Ephesus, and was 660 feet across. These theaters were built with seats in semicircular rows rising one behind and above the other, and were often cut out of solid rock. In the center, at the lowest point, stood the orchestra, in front of the *proscenium* or stage, back of which was a solid wall, called the scene, ornamented with pillars and cornices. There was no roof, but an awning kept off the sun's rays, for the plays were always given in daytime. The Romans, who took the best of everything the Greeks had, built similar theaters of the greatest magnificence, besides their huge amphitheaters. Both in Athens and Rome the theaters were built large enough to seat almost all the citizens, who generally attended in a mass at the expense of the government, for from the time of Pericles plays were made free to all. To enable these audiences of 80,000, 100,000 or more to hear, the actors wore masks with mouthpieces which answered the purpose of speaking-trumpets. Female characters were represented by boys, and it was not till the 17th century that actresses were allowed on the French and English stages. In the middle ages the miracle-plays were played in cathedrals.

The modern theater dates from the 16th century, the first ones being built at Vicenza and Venice. The famous Palais Royal at Paris was built by Cardinal Richelieu in 1639. The first English playhouse was the London theater, built in 1576. About the same time were built the Curtain, Blackfriars and Whitefriars. The first theater in America was opened at Williamsburg, Va., in 1752. The largest and finest theater in the world is the Grand Opera-House of Paris. In China and Japan every little village has its theater. See AMPHITHEATER, DRAMA and MIRACLE-PLAYS.

Thebes (*thēbz*), a celebrated Egyptian city, stands on the Nile, and anciently was the capital of upper Egypt. Its great ruins fill nine townships. The Nile flows through the city and divides it into four quarters. Thebes was at its height from 1500 to 1000 B. C., when it had supplanted Memphis, the ancient capital of the Pharaohs. This City-of-a-Hundred-Gates, as Homer called it, sent out 20,000 war-chariots, was filled with palaces and temples, and contained the cemeteries of the Theban monarchs. Later the capital was moved to Sais and then to Memphis, and Cambyses, the Persian plundered it of $10,000,000. Alexandria was founded, and so its splendor departed. There are now only a few Arab families of *fellahin*, who gain a living by guiding travelers about the ruins or by selling articles rifled from the tombs. The ruins are the most famous in Egypt. Among them are the temple of Karnak (*q. v.*), a mass of obelisks, courts and halls; the Ramesseum (*q. v.*), built by Rameses II, with a broken colossal statue, the largest in Egypt, of that king, weighing 887½ tons; the vocal statue of King Memnon, supposed in early times to make a sound at sunrise; the cemeteries of the sacred apes; and the Valley of the Tombs of the Queens. See Rawlinson's *Story of Ancient Egypt*.

Thebes, the chief city of Bœotia in Greece stood on a mountain-slope between two streams in the southern part of Bœotia.

It is said to have been founded by a colony of Phœnicians under Cadmus, after whom the city was called Cadmeia, a name afterwards applied only to the citadel. Nothing certain is known of the place till its unsuccessful war with Athens in the 6th century B. C. During the Persian War Thebes sided with Xerxes against the other Greek cities, and for this desertion Athens wished to deprive it of its leadership of the Bœotian towns, but it was saved by the interference of jealous Sparta. It sided with Sparta in the Peloponnesian War, but soon afterwards, fearful of Sparta's great power, befriended the Athenians who fled from the oppression of the Thirty Tyrants, and sent a force of its citizens with Thrasybulus and his fellow-patriots to deliver Athens. Thebes became the foremost power in Greece after the long war (379-362 B. C.) in which, under the leadership of Epaminondas, she triumphed over Sparta. Demosthenes induced Athens and Thebes to join hands against the encroachments of Philip of Macedon; but it was too late, and in 338 the battle of Chæronèa crushed the liberties of Greece; a second rising was put down by Alexander, who razed Thebes to the ground and sold the whole body of citizens — men, women and children — into slavery. Rebuilt in 315 by Cassander, it was destroyed by the Romans; was again a thriving town in the 11th and 12th centuries; but now has only about 3,250 inhabitants.

Theiss (*tīs*), an important branch of the Danube and the chief river of Hungary, is formed by the Black Theiss and the White Theiss in the Carpathian Mountains on the borders of Galicia. It flows through a mountain-pass, then in a zigzag course past Tokay and Szolnok, and for 300 miles parallels the Danube. It is navigable for large vessels to Szolnok, and is 828 miles long.

Themis (*thē'mĭs*), in Greek story, was the daughter of Uranos and Gæa (Heaven and Earth), the wife of Zeus and mother of the hours, fates, equity, justice and peace. In modern art Themis is represented as Justice with her eyes bandaged, holding a pair of evenly balanced scales in one hand and a sword in the other.

Themistocles (*thĕ-mĭs'tō-klēz*), a great Athenian general and statesman, was born about 514 B. C. In politics he became the rival of Aristides the Just, who was ostracized in 483 B. C., leaving Themistocles the foremost citizen of Athens. To get ready for the coming Persian invasion Themistocles persuaded the Athenians to set apart the proceeds of the government silver-mines for building a navy, believing that the only chance of victory was on the sea. The naval victories of Artemisium and Salamis (480) were won from the Persians chiefly through the efforts of Themistocles, though he allowed the standing claim of Sparta to the chief command, which was given to Eurybiades. The victory at Salamis (*q. v.*) raised his reputation to the highest point. But his popularity lasted only till 471, when he was banished for bribery. The rest of his life was spent at the Persian court of Artaxerxes, where he was greatly honored. See Fyffe's *Primer of Greek History*.

Theocritus (*thē-ŏk'rĭ-tŭs*), a famous Greek poet, a native of Syracuse, who flourished about 272 B. C. About the close of the reign of Ptolemy Soter he visited Alexandria, where his first verses were written. Here Ptolemy Philadelphius became his patron, but later we find him back at the court of Hiero II of Syracuse. For some reason he became dissatisfied with court-life. Turning his attention to the scenes and life of the country, he wrote 30 unexampled idyls of the everyday life of the Sicilian peasantry, which keep their charms of freshness and nature even to the present day. Besides the idyls, a few lines of a poem called *Berenice* and some epigrams are all that are left of his writings.

Theod'olite, an instrument used by surveyors, specially constructed for measuring horizontal and vertical angles by means of a telescope the movements of which can be graduated and marked very accurately. For triangulation-work theodolites are usually made larger and more powerful than transits. In instruments made in this country the graduation is in ordinary degrees of 90 to the quadrant; though those constructed abroad, especially in France, have the centesimal division of 100 grades to the quadrant.

Theodoric (*thē-ŏd'ō-rĭk*) **the Great,** the founder of the kingdom of the Ostrogoths, which embraced Italy, Sicily, southeastern Gaul, Rhætia, Noricum, Pannonia and Dalmatia, was born at Neusiedler Lake, south of Vienna, in 455 A. D. His father, Theodemir, and two uncles had freed their nation from the yoke of the Huns on the death of Attila; part of the Goths had gone to Italy and Gaul; and Theodemir was left sole king of the Ostrogoths in Pannonia. Theodoric spent his boyhood as a hostage at the court of Constantinople, where he was brought up with Emperor Leo's children. After proving himself an able warrior, Theodoric became king of his people in 475. Two wars were now waged against Emperor Zeno, who, to save his capital from the Ostrogoths, urged Theodoric to conquer Italy, then ruled by Odoacer, the usurper. In 488 the young king led the whole nation, some 200,000, across the Alps, won four pitched battles, shut up Odoacer in Ravenna and after a three years' siege, captured both the usurper and the city. Once king of Italy, he governed the peninsula as well as it had ever been ruled under the Roman empire. He protected the Visigoths, checked the Franks and gained Provence. Near the end of his prosperous reign a conspiracy was

discovered in which Boëtius the philosopher, his favorite, seemed to be mixed up. After the supposed traitor had been put to death his innocence was proven, and Theodoric's remorse undoubtedly hastened his death in 526. See Boëtius and Goths.

Theodosius (*thē'ō-dō'shĭ-ŭs*) **I, The Great,** was of Spanish descent, and was born about 346 A. D. His father was Theodosius, the able general who freed southern Britain from the savage Caledonians. Theodosius accompanied his father in his British campaigns, but after his murder retired to his estate in Spain. From this retreat he was summoned by Emperor Gratianus, who made him his fellow-ruler and intrusted him with the government of Thrace, Dacia, Macedonia, Egypt and the east. Here he found himself face to face with the dreaded Goths, whom his army dared not confront in the open field. By bribes and promises he succeeded in making peace with them; and the magnificent funeral-honors paid to Athanaric, their king, who died at Constantinople, so pleased the Goths that many served in his armies. On behalf of Valentinian II, his brother-in-law, he conquered Maximus, the usurper, and in 392, when Valentinian was strangled by Arbogastes, his general, Theodosius a second time marched on Rome, defeated Arbogastes and became master of the whole Roman world. He had hardly won this vast power, when he died at Milan, Jan. 17, 395.

Theophrastus (*thē'ō-frăs'tŭs*), a Greek philosopher, born at Eresus, Lesbos, about 372 B. C., died in 288 B. C. He was the disciple of and successor to Aristotle, and for 35 years presided over the Peripatetic school or teaching and disputing school of logicians, who, as they talked, perambulated along the walks of the Lyceum at Athens. Theophrastus was noted for his observational and scientific habits and for his early contributions to botanical science. Though a member of the Platonic circle at Athens, he specially interested himself in researches about plant-life and left a *History of Plants* and the remains of a work dealing with the *Principles of Vegetable Life*. He also wrote a series of sketches of character, which have been taken as models by modern writers.

Theos'ophy, a knowledge of divine things, concerning God and the deeper mysteries in relation to man and nature, having its early source in India and in our day erected into a sort of philosophic system, taught and supposed to be got at by extraordinary illumination. Theosophy to-day has its societies, with a widely extended organization in many countries abroad and at home, treating of soul-science, reincarnation, esoteric matters and what in general is termed occultism. According to the devotees of theosophy much of what they hold and teach formed part of the ancient systems known as Brahamism, Buddhism, Pythagoreanism, as also of the Greek mysteries, the Roman worship of Isis and of later eclectic philosophies, including the mystic teaching embraced in the Jewish Cabbala. In this country theosophy was first propagated by Madame H. P. Blavatsky, a Russian lady, in 1873. Two years later, in conjunction with Colonel H. S. Olcott and Wm. W. P. Judge, she founded a society in New York City, with headquarters subsequently opened at Adyar, Madras, India. The objects of the society were to form "a nucleus of the universal brotherhood of humanity;" "to encourage the study of comparative religion, philosophy and science; and to investigate unexplained laws of nature and the powers latent in man." The society has affiliated organizations in almost all countries, and in the United States it to-day has 69 churches, with 2,663 members. Much literature has been published, including Blavatsky's *Isis Unveiled;* Besant's *Reincarnation* and *Karma;* and Sinnett's *Esoteric Buddhism.*

Theresa (*tē-rē'sà*) or **Teresa** (*tā-rā'sà*), **St.,** was born at Avila, Spain, March 28, 1515. She was noted for her piety when a child, and, when only seven, with her little brother she ran away from home to gain the crown of martyrdom among the Moors. She entered a Carmelite convent at 20, and later founded the order of Barefooted Carmelites. Her reform had the support of the pope, and during her life 29 convents of the reformed order were opened. Theresa was made a saint by Gregory XV, and her feast day is Oct. 15. Her letters and treatises, besides being considered by Roman Catholics as among the most precious of their writings, have also gained a place among Spanish classics. St. Theresa died on Oct. 4, 1582. See her *Life* by Dalton.

Ther'mograph, a device for automatically recording the variations of temperature in a room, factory or greenhouse by means of dials electrically connected with registering thermometers in the building or apartment where the tests of temperature are to be made. The thermograph not only registers the fluctuations in the temperature in a room, but serves incidentally as a fire-alarm, since it is made to sound a gong when the instrument records a temperature exceeding 100° F. See Thermostat.

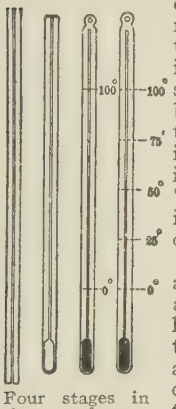
Thermom'eter, an instrument for measuring temperature. There exists a great variety of thermometers based upon a great variety of principles. But those which are most frequently used are dependent upon the fact that the volume of a fluid changes when its temperature changes. For ordinary temperatures the most important thermometers are those which employ mercury or some gas (generally air or nitrogen) as the expanding fluid. (For the measurement of high temperatures see Pyrometer.)

THE MERCURIAL THERMOMETER

The principle of the mercurial thermometer is that mercury when heated expands more than glass. If, therefore, a glass-tube having a bulb blown at one end be partially filled with mercury and immersed in a bath at a higher temperature than its own, the mercury will rise in the tube. If the bath have a lower temperature, the mercury will fall. If the mercury neither rise nor fall we may fairly conclude that the mercury and the bath are each at the same temperature. The essential features of a good thermometer are that it must be easily portable; permanent; always give the same reading when subjected to the same temperature; render it possible for the user to test the correctness of its graduation and determine any errors in its graduation; and be relatively small, so that when placed in contact with a second body the temperature of the second body will not be seriously affected.

In making a thermometer which will satisfy these conditions, the peculiar advantages of mercury are that it is easily prepared in a pure state; does not wet glass or stick to it; expands rapidly with changes of temperature, so that its changes in volume are easily read; that to each particular volume corresponds a definite temperature, which is not the case with water; and that it does not freeze except at temperatures comparatively low, and does not boil except at temperatures comparatively high.

The accompanying figure illustrates the four principal steps in the manufacture of an ordinary mercurial thermometer. First, a piece of thick-walled, capillary tubing of uniform bore is selected; a bulb is then blown on one end of this tube, after which the bulb is filled with mercury. It is then highly heated and "sealed off." The last step is the graduation of the tube of the thermometer.



Four stages in the manufacture of a mercurial thermometer.

Now it happens that there are two temperatures which are easily reproduced in the laboratory. These are the temperatures of melting ice and boiling water. On the centigrade scale the first of these is called 0° and the second 100°. The apparent change of volume between these two points is divided into 100 equal parts, each indicating *one degree*. On the Fahrenheit scale the interval between melting ice and boiling water is divided into 180°, the lower temperature being called 32° and the higher temperature 212°. For the *gas thermometer* the student is referred to Preston's *Theory of Heat*, Sec. II. See TEMPERATURE.

Thermopylæ (*thĕr-mŏp'ê-lē*), a famous pass leading from northern to central Greece, between Mt. Œta and an impassable marsh on the edge of the Maliac Gulf. The pass narrows at each end to the width of a single wheel-track, forming the eastern and western gates. Here King Leonidas (*q. v.*) of Sparta made his famous stand against the mighty army of Xerxes in 480 B. C. Learning that a Thessalian had betrayed to the Persians a path over the mountains to his rear, he sent away all his troops, which numbered some 7,000, except 300 Spartans, 700 Thespians and 400 Thebans. This chosen band made a sally and perished to a man. But one Spartan who was too sick to fight, escaped, only to meet the scorn of his countrymen on his return home.

Ther'mostat, Elec'trical, is an instrument for giving an alarm when the temperature rises to a point where the instrument completes the circuit, or when it falls to a point to produce a similar result. They are used in stoves, hothouses, dwellings and wherever uniform temperature is of vital importance. They are also used as maximum thermometers or fire-alarms. Various devices are employed, the simplest being the ordinary mercurial thermometer, the upper end of the tube not being hermetically sealed, but closed by an airtight cork of rubber, through which passes a metallic rod that can be raised or lowered in the tube. Whenever the expanding mercury reaches the tip of the rod, an electric current is closed and the alarm sounded. This alarm-current may be arranged so as to set off an electromagnet which will open or close a register or regulate the draft in the furnace. See THERMOGRAPH.

Thermotropism (*thĕr-mŏt'rô-pĭz'm*), the sensitiveness of a plant to heat coming from one side, in response to which the rate of growth is so unequally affected as to cause the part to bend toward or away from the source of heat; *e. g.*, corn-seedlings and hyacinth-leaves bend toward a warm iron-plate (30°C) placed near them; cress-seedlings turn away from it. See GROWTH and IRRITABILITY.

Theseus (*thē'sē-ŭs*), a famous Greek hero, said to have been the son of Ægeus, king of Athens. His most noted exploit was his offering himself as one of the youths yearly delivered to the Cretan minotaur, for the purpose of killing that monster. Ariadne, daughter of King Minos of Crete, fell in love with him and gave him a sword and a clue of thread, with which he killed the minotaur and escaped from the famous labyrinth. The fatal ship which carried the tribute youths always carried black sails. Theseus had promised his father to hoist white sails if successful in his undertaking. This was forgotten, and the king, thinking his son killed, threw himself into the sea. Theseus became king. He is said to have waged war

against the Amazons and the Centaurs, to have been one of the Argonauts, to have taken part in the Calydonian hunt, and to have carried off Helen from Sparta when she was only nine years old. For this he was attacked by Castor and Pollux, was driven from his throne by a revolt of the Athenians, and was killed by treachery.

Thes'saloni'ca. See SALONI'CA.

Thes'saly, the largest state of ancient Greece, reaching from Thermopylæ to the Cambunian mountains and from Mt. Pindus to the Ægean. But often the name was applied only to the Thessalian plain, which was surrounded by mountains and was the most fertile part of Greece. The plain was divided into two parts, Upper Thessaly the chief city of which was Pharsalus, and Lower Thessaly, having Larissa as its main city. The Thessalians were said to have emigrated from Epirus. There were three classes in the country: the rich land owners; Achæans and other conquered tribes; and serfs, who probably were the first dwellers in the land. In early times wars were carried on with the Phocians. About 400 B.C., under the tyrants Lycophron, Jason and Alexander, Pheræ became the foremost city and brought all Thessaly under its rule. Thessaly fell successively into the hands of the Macedonians, Romans and Turks. Part of it now belongs to Greece. See Grote's *History of Greece* and Fyffe's *Primer of Greek History.*

The'tis. See ACHIL'LES.

Thian-Shan or **Celestial Mountains** are a chain in Central Asia, which extends from Pamir Plateau eastward as far as southern Mongolia. Some of the peaks attain the great height of 24,000 feet. There are a few extinct volcanoes in the range, and among the most typical rocks in its formation are granite, schist and limestone. On its western side the Thian-Shan chain subdivides into several ranges which are set in a fan-like formation.

Thiers (*tyâr*), **Louis Adolphe,** a French statesman, was born at Marseilles, April 16, 1797, the son of a locksmith. After attending the lyceum at Marseilles, he studied law at Aix. He then went to Paris to seek his fortune, and after a hard struggle with poverty became a newspaper writer and soon was widely known. But it was his popular *History of the French Revolution* which carried him from his garret in an out-of-the-way alley to fame, both as a writer and in politics. In 1830 he established a new democratic paper, *The National,* which greatly helped to bring about the revolution of 1830. Thiers at once became one of the ablest debaters in the chamber of deputies. He was minister of the interior in 1832, later was minister of commerce and agriculture, and in 1836 prime minister. A disagreement with the king in regard to the fortification of Paris led to his resignation and gave him the opportunity to begin his *History of the Consulate and of the Empire,* adding to his material by visiting England and personally inspecting the battlefields of Germany, Italy and Spain. He still was an acknowledged leader in politics, and protested against French union with England in her objections to the annexation of Texas, being unwilling, he said, to act against "the great American nation, the harbinger of French liberty." After the revolution of 1848 he became prominent in the assembly, supporting Louis Napoleon as president but warning the nation in vain of the danger of a new empire, thus causing his imprisonment and exile at its establishment. His return to the assembly was marked by his great speech against the enormous outlay in the Italian War and the expedition to Mexico and in improving the city. In 1870 he predicted defeat in the Franco-Prussian War, and, as chief of the executive, was successful in procuring a treaty of peace, in crushing the Commune (*q. v.*) and in carrying out a national loan for paying the German indemnity. He was given the title of president on Aug. 31, 1871, and succeeded in obtaining the withdrawal of German troops from French soil, but resigned in 1872. He was gathering material for a history of art and was writing his memoirs, when he died near Paris on Sept. 3, 1877.

LOUIS ADOLPHE THIERS

Thirty-nine Articles, The. The public standard of religious belief adopted by the Church of England. Their principles developed from 1534, when papal authority was thrown off by the English church, till 1582, when Convocation added its sanction. Next year they were published by royal authority. The articles are not intended to be a complete system of theology, but only to enumerate certain truths of such primary importance that denial of one is sufficient ground for exclusion from the church. They were framed for the establishment of consent regarding true religion, and treat of the doctrine of the trinity (Arts. 1-5); the sources of knowledge of religious matters (Arts. 6-8); sin and redemption (Arts. 9-18); and necessary relations of Christians as members of a religious community (Arts. 19-39). They were adopted by the General Convention of the American Episcopal Church in 1801, the Athanasian creed being excluded. In 1784, under Wesley's advice, the Methodist Episcopal church revised and adopted 25 of them.

Thirty Tyrants, The, were the body of aristocrats who governed Athens in the period after her defeat by Sparta in 404 B. C. The chief of these tyrants was Critias. They were chosen by the Spartans, who hoped to govern Athens by setting the aristocratic above the hitherto dominant democratic party; but in 403 they were overthrown by Thrasybulus and the Athenian exiles who returned with him. A secondary usage of the name occurs in Roman history, as applied to the military commanders who terrorized various parts of the Roman empire during the anarchical reigns (A. D. 253-68) of Valerian and Gallienus.

Thirty Years' War (1618-48), a terrible, continental struggle in Central Europe partly religious and partly political, which involved Germany and Austria, Bohemia, Denmark, Sweden and France. The war had its origin in 1618 in Bohemia, which, from being an elective monarchy and since the days of Huss and Jerome of Prague strongly Protestant, had come into the possession of the Roman Catholic house of Hapsburg, which ruled it despotically. In 1609 Rudolph, king of Bohemia and son of emperor Maximilian II, was forced, though under the influence of the court of Spain, to grant religious freedom to the Bohemian Protestants; but having in 1611 been intrigued against by his brother Matthias and displaced by him from the throne, the latter violated the concession made by Rudolph. The Bohemians retorted by throwing the imperial commissioners out of a window in the Hall of Regents, insisted on their rights as Protestants, and proceeded to fight for their religious privileges. The forces then arrayed against Protestantism were those of the House of Austria, which feared to lose its territories by the conflict impending, and those of the Catholic League, at whose head was the Duke of Bavaria, whose country was in the war that followed ravaged by the Swedes and French. In 1619 Emperor Matthias died, and was succeeded by Ferdinand II; him, however, the Bohemians would not accept, but chose a rival in the person of Frederick V, Elector of the Palatinate, son-in-law of James I of England. This action dispelled all hope of reconciliation between Bohemia and Austria, and the war, aided by the Duke of Savoy, was proceeded with under Thurn and Mansfeld; but, though Bohemia at first met with some successes, its forces were hard pressed by those under Count Tilly, who commanded the troops of the Catholic League and in November of 1620 met the elector's army at White Mountain, outside the walls of Prague, and there defeated and routed it, the elector barely escaping capture. Frederick, though he found refuge at The Hague, was deposed and lost his dominions; but Mansfeld and the Protestant party in Bohemia continued the war; which was now (1625) joined by Christian IV of Denmark, who for the time became leader of the Protestant rising in northern Germany. He however, met with defeat at the hands of Count Tilly at Lutter in Brunswick (Aug. 27, 1626); Mansfeld also suffering defeat in the previous April by Wallenstein, the imperial general, at the bridge of Dessau in Anhalt. After this the whole of Silesia was dominated by the forces of the league, while Tilly and Wallenstein, joining their armies, pursued the Danes to the far north; and presently the whole of Schleswig and Jutland, save a few fortified towns, fell into their hands. Of these, the northern seaports of Stralsund and Glückstadt heroically held out against their besiegers; but Denmark, having had enough of the war, concluded with Ferdinand II the peace of Lübeck (May 22, 1629), Christian receiving back all his hereditary possessions and resigning all claim to the bishopric held by his family within the Holy Roman Empire. In the following year Wallenstein was dismissed by his master, owing to repugnance at the excesses of his soldiery, complained of at a meeting of the electors of the empire at Ratisbon.

At this juncture a new period of the Thirty Years' War is entered, by the intervention of Sweden and the appearance of Gustavus Adolphus (*q. v.*), the great Swedish king and soldier, of the royal house of Vasa. Gustavus had just concluded an armistice with Poland, through the mediation of Richelieu. Being loyal to the principles of the Reformation, he ardently intervened in the struggle between Roman Catholicism and Protestantism. Unfortunately his career was a short one, for he fell at Lützen (Nov. 16, 1632), though not before his Swedes were victorious over Wallenstein (who had been reinstated in command), and he had beaten Tilly at Breitenfeld with frightful loss to the Austrians. Despite the death of the Swedish king the war went on, Bernhard of Weimar, the companion of Gustavus, leading the Protestants, and Wallenstein commanding the imperial troops. With the religious objects of Ferdinand II and the Catholic League Wallenstein, however, had little sympathy; his object was rather that of selfish aggrandizement. Seeing that to be the case, a conspiracy was formed against him, which led to his assassination, inspired by Spanish gold. This occurred on Feb. 25, 1634.

Wallenstein's removal marks a turning point in the war for it now ceased to be a purely German and Protestant struggle. "In the course of years the German contest had come to involve all the rivalries and enmities which then agitated Europe: the quarrels of Sweden and Poland, the jealousy of Denmark against its northern neighbor, the struggle of Spain to reduce the Dutch into subjection and, above all, the enmity between France and Spain, which dated

back to the time of Charles V. It was these foreign interests that prolonged the war for the next 13 years."

At this juncture France comes upon the scene, taking the side of the Protestant powers of Germany at the very period when she was persecuting her own Protestant subjects. The reason, however, was not only her desire to crush the power of the house of Hapsburg, ascendant then both in Spain and in Austria, but, among other objects, to secure possession of Alsace and Lorraine for France and the empire. This was the motive and ambition of Richelieu, who coveted the Rhine provinces. Meanwhile, though the war had been maintained in the Protestant interest by Bernhard of Saxe-Weimar, the latter met with a sanguinary defeat (Aug. 27, 1634) at Nördlingen in Bavaria; and by the following spring the whole of southern Germany was in the hands of the imperialists. In spite of this check Bernhard and the Swedes continued the struggle, and four years later he defeated the imperialists at Rheinfelden, and captured Breisach. While these events were happening, Ferdinand II died and was succeeded by Ferdinand III who pursued the same ultramontane policy; and Bernhard himself also died. France and Sweden meanwhile prosecuted the terms of their alliance, the French invading the Spanish Netherlands; the Dutch destroyed a Spanish fleet; and Portugal, taking advantage of an insurrection in Spain, regained independence. The end now came in sight, for France on the Rhine had Condé and Turenne, the great generals, at the head of her armies, and Mazarin had succeeded Richelieu as French prime minister. Condé defeated the Spanish at Rocroi near the Belgian frontier; and at Allerheim he routed the imperialists (Aug. 3, 1645). Turenne, on the other hand, effecting a junction with the Swedish army, with it invaded Bavaria and overthrew Maximilian, who had been one of the chief organizers of the Catholic League. The war terminated with the peace of Westphalia (Oct. 24, 1648) and the occupation by the Protestant army of Prague, where the struggle had had its commencement. The gains of the war fell chiefly to France and Sweden; while Lutherans, Calvinists and Catholics alike were accorded religious freedom. But Germany did not recover for 200 years.

G. M. A.

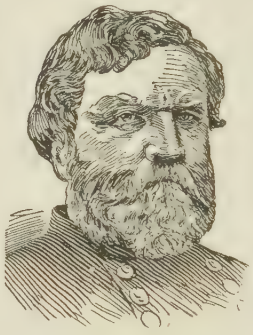
THISTLE

Thistle (*thĭs''l*), the name of species of certain genera of the composite family, popularly characterized by being stout and spiny. The genus to which the common thistles belong is *Cnicus*. Some of them are among our worst weeds, and their seed-like fruits (akenes) with plumy tufts of soft hairs are wafted everywhere on currents of air. The well-known Canadian thistle (*C. arvensis*) is wrongly named, as it is a noxious weed from Europe.

Thom'as a Kem'pis. See KEMPIS.

Thomas, Saint, one of the 12 disciples of Christ, is rarely mentioned in the New Testament. He is called doubting Thomas, as he refused to believe in the resurrection of Jesus until he had seen and touched Him. According to various accounts he preached either in Parthia, Egypt, Ethiopia or India.

Thomas, George Henry, an American general, was born in Southampton County, Va., July 31, 1816. He was graduated from West Point in 1840, W. T. Sherman being a member of the same class. He served in the Seminole and Mexican Wars, and later was appointed a professor at West Point. For six years he was in service in California and Texas. On the outbreak of the Civil War he remained loyal to the Union, and was made a brigadier-general. He served first in the valley of Virginia, but was soon sent to Kentucky and placed in command of a division. Here in Jan., 1862, he defeated the Confederate forces under Zollicoffer, and was promoted to major-general. In the hard-fought battle of Stone River, Tenn., he rendered distinguished service, showing his characteristic staying qualities. In the battle of Chickamauga, when the Union right was routed and Gen. Rosecrans gave up the field for lost, Thomas, who was in command of the left, held his position against the repeated onslaughts of the victorious Confederates, thus saving the army and earning the title of The Rock of Chickamauga. In the battle of Missionary Ridge Thomas with the army of the Cumber and held the Union center, which carried the enemy's intrenchments, scaled the heights and took the Confederate lines on the crest. Thomas rendered conspicuous service in the Atlanta campaign, which ended in the capture of that city. When Sherman started on his march to Savannah, Thomas was left to oppose the Confederate army under Hood, who moved west and north toward Nashville. While concentrating his forces at Nashville, Thomas



GEORGE HENRY THOMAS

sent Schofield to check Hood's advance, resulting in the hard-fought battle of Franklin. When Hood appeared before Nashville, Thomas delayed to attack him, taking time to organize and equip the detachments which had come to him from different points. Fault was found with him for his slowness to act; but when he finally attacked and routed Hood's army on Dec. 16, 1864, winning one of the most important victories of the war, his wisdom and sagacity were fully vindicated. He received the thanks of President Lincoln and of Congress, was promoted to be major-general in the regular army and received a gold medal from Tennessee. After the war General Thomas was in charge of several military districts. He declined the rank of lieutenant-general which was offered him, saying that he had done nothing since the war to merit promotion. He died at San Francisco, March 28, 1870.

No officer in the Civil War inspired in his men a greater measure of enthusiasm and personal affection than "Old Pap" Thomas, as he was affectionately called by his devoted army. As a commander he demonstrated qualities of the highest order, and will stand as one of the foremost figures in the history of the Civil War.

Thomas, Theodore, American orchestra-leader and conductor of the Chicago orchestra, was born at Esens, Hannover, Germany, Oct. 11, 1835, and came to the United States in 1845. He studied music assiduously and made his *début* as a solo violinist, afterward taking part in concerts and on tours in various parts of the country. In 1864 he inaugurated orchestral concerts, and three years later organized the Thomas orchestra. He subsequently became conductor of the Brooklyn and New York Philharmonic Societies, and on his removal in 1891 to Chicago he became conductor of an orchestra there and was musical director of the Columbian Exposition in 1893. He conducted notable musical festivals at Cincinnati in successive years, as also at New York and Chicago, and did much to further the interests of music in America and develop public taste for it. He died on Jan. 4, 1905.

Thom'asville, Ga., a city, the seat of Thomas County, on the Atlantic Coast and Atl. and Birm. railways, about 200 miles southwest of Savannah. It is an attractive winter-resort, with several large hotels, and is in an elevated, picturesque region, producing varied fruits, including figs, melons and grapes; while cotton, and tobacco are local staples. Its industries embrace cotton-compresses, carriage-works, planing-mills, creameries, a basket-factory and lumber-mills. It owns and operates its own water-works and electric-light plant, and has a city hospital and a public library, several educational institutions, including South Georgia College, Yoning Female College, and the Vashti Home for Girls. Population 5,322.

Thomp'son, Sir **Benjamin,** better known as Count Rumford, a brilliant engineer, statesman and soldier, born at Woburn, in Massachusetts, 1753; died at Auteuil, a suburb of Paris, in 1814. He appears to have been well-educated in spite of the fact that he largely was self-educated. Being an English sympathizer, he went to England at the outbreak of the American Revolution. Here he rapidly advanced in the state department. In 1779 he was elected fellow of the Royal Society. At the invitation of a Bavarian prince he went to Munich in 1783, where he remained for 11 years as minister of war and minister of police. During this period, while superintending the construction of cannon at the arsenal, he made a series of experiments which led him to think that heat is not an imponderable fluid, but a form of energy. He, therefore, is justly called one of the founders of the mechanical theory of heat. At Munich he was made Count Rumford. He and Sir Joseph Banks took part in the establishment of the Royal Institution in London. Rumford's second wife was the widow of Lavoisier, the distinguished chemist.

Thompson, Launt, an American sculptor, was born in Ireland in 1833, but was brought up in Albany, N. Y. He was nine years in Palmer's studio in Albany, where his bust of *Little Nell* made him well-known. A statue of General Winfield Scott, at the soldiers' home near Washington, a soldier's monument at Pittsfield, Mass., a colossal statue of Napoleon and a statue of the first president of Yale on the college grounds are some of his larger works. He died at Middletown, N. Y., Sept. 26, 1894.

Thompson, Richard Wigginton, an American politician and ex-secretary of the United States navy, was born in Culpeper County, Va., June 9, 1809, and died at Terre Haute, Ind., Feb. 9, 1900. When a young man, he was a clerk in Louisville, Ky., but afterwards moved to Lawrence County, Ind., where he studied law and was admitted to the bar. In 1834 he became member of the state legislature and later of the senate, acting for a time as president of the senate and lieutenant-governor. In 1841 he was elected to Congress, serving for several terms, and for a time was judge of the fifth Indiana circuit. In 1877 he entered Hayes' cabinet as secretary of the navy, and became chairman of the American Committee of the [French] Panama Canal Company. He wrote *History of the Tariff*, *The Papacy and the Civil Power*, *Footprints of the Jesuits* and *Personal Recollections of Sixteen Presidents*.

Thom'son, James, a British poet, was born in Roxburghshire, Scotland, Sept. 11, 1700. He studied six years at Edinburgh. His fame rests upon his poem, *The Seasons. Winter* appeared in 1726, followed by *Summer* (1727), *Spring* (1728) and *Autumn.* He wrote several dramas, *Agamemnon, Edward and Eleonora,* and *Tancred and Sigismunda.* The *Castle of Indolence,* next to *The Seasons* his best-known work, was written in 1748. The song *Rule! Britannia* is found in a masque, *Alfred,* written by Thomson in connection with Mallet. He died near Richmond, England, Aug. 27, 1748.

Thomson, Joseph John, a brilliant young English physicist, who has since 1884 occupied the most important chair of physics in Great Britain, that of *Experimental Physics* at Cambridge University. He was born near Manchester, Dec. 18, 1856; was educated at Owens College and at Trinity College, Cambridge, where he graduated as second wrangler and second Smith's prizeman in 1880. His work has been of profound character. Aside from numerous contributions to periodical literature, the following works give some idea of his activity: *Treatise on Vortex Motion; Application of Dynamics to Physics and Chemistry;* and *Recent Researches in Electricity and Magnetism.* In 1899 he achieved the division of the hydrogen atom. By a clear and logically connected series of experiments he split a small part from the hydrogen atom, which he calls a corpuscle. It has a mass of only one-thousandth of that of the hydrogen atom. For a popular account of this work consult *The Astrophysical Journal,* Vol. XI., pp. 170–4 (1900). See ATOM and HYDROGEN.

Thomson, Sir William. See KELVIN, LORD.

Thor (*thôr* or *tôr*), in Scandinavian myth, was the oldest son of Odin and Frigga and was the god of thunder. He ruled winds, seasons and agriculture. The *Eddas* speak of him as the champion of gods and men, hurling his thunderbolts at his enemies,—the monsters and giants. His weapon was an enormous hammer, which, after it was thrown, came back into his hand. He never grew weary. No matter how much strength he spent, it was renewed by a magic belt which he wore around his waist. Thursday is named from Thor.

Thoreau (*thō'rō*), **Henry David,** was born at Concord, Mass., July 12, 1817. He graduated at Harvard College in 1837, and became a surveyor. He lived the simplest of lives, spending most of his time in long tramps through the woods, in the study of nature and in writing. Emerson says of him: "He was bred to no profession; he never married; he lived alone; he never went to church; he never voted; he refused to pay a tax to the state; he ate no flesh; he drank no wine; he never knew the use of tobacco; and, though a naturalist, he used neither trap nor gun." This poet-naturalist built with his own hands a small cabin on the banks of Walden Pond near Concord, and lived there by himself for two years. His expenses during these years were nine cents a day, and he gave an account of his experiences in perhaps his finest book, *Walden,* published in 1854. Others were *Cape Cod, The Maine Woods* and *A Yankee in Canada.* No one else has lived so close to nature or so written of it. He died at Concord, May 6, 1862. See *Thoreau the Poet-Naturalist* by Channing and Sanborn's *Thoreau* in The American Men of Letters Series.

Thorn, a conspicuous rigid and sharp structure of plants. Thorns may be transformed leaves or branches, and are most extensively developed by plants of the arid regions.

Thorwaldsen (*tôr'wald-sĕn*), **Albert Bertel,** one of the greatest of modern sculptors, was born probably at Copenhagen, Nov. 15, 1770. When asked where he was born he said: "I don't know; but I arrived at Rome on March 8, 1797," thus dating his birth, as it were, from the beginning of his career as an artist. He was a son of a poor ship-carpenter, and first carved figureheads in the shipyard where his father worked. He had little schooling, and always was a poor writer and speller, but by 1793 he had gained a gold medal for a design and with it a chance to study abroad for three years. Only after long and hard study did he at last (1803) gain recognition by his *Jason,* but from this time he prospered. His return to Denmark in 1819 was triumphal and his reception almost royal. But a year later found him back at Rome, which he made his home. Thorwaldsen died on March 24, 1844, leaving to his country most of his great works and the bulk of his fortune, with which to build a museum where they should be kept. Of his many busts that of Byron is one of the finest. His famous *Christ and the Twelve Apostles* is in the cathedral of Copenhagen. See his *Life* by Plon.

Thrace (*thrās*), in ancient times the name of a country bounded by the Danube, the Euxine and Ægean Seas, Macedonia and Illyria. Roughly speaking, ancient Thrace, before the rise of the Macedonian power, embraced the territory now divided into Rumelia and Bulgaria. Under the Romans it included only the part south of the Hæmus or Balkan Mountains, while the northern part was called Mœsia. It was a mountainous country, the chief range being the Hæmus or, as it is now called, the Balkans, the highest peaks of which are over 8,000 feet above the sea. It was marshy and undrained, covered with deep

forests of fir, oak, chestnut etc., but parts of it, as the great plain of Adrianople, were very fertile; cattle, sheep, horses and swine were kept; and the chief products were wheat, millet, hemp and wine. Its gold and silver mines led to conquest by Philip of Macedon and by Lysimachus. Who the early Thracians were is not known. They were not Greeks, and they lived by robbery and war. The Greeks first heard of them through their coastal colonies, the chief of which was Byzantium. But the interior of Thrace kept its independence, except for a short time when conquered by the Persian general Megabazus, until conquest by Macedonia. In 168 B. C. it became Roman territory, was colonized by Sarmatians and Goths, overrun by Attila and Alaric, and conquered by Amurath the Turk in 1353.

Thrasher. See THRUSH (BROWN).

Thread, a twisted filament of flax, wool, cotton, silk or other fibrous substance, making a fine, strong and well-rounded as well as lengthy line for sewing with. For the operation of drawing out and twisting into thread see SPINNING.

Three Rivers, Can., county-seat of Maurice County, Quebec, is on St. Lawrence River at the head of tide-water and where the St. Maurice divides before entering the greater stream. It extensively manufactures the bog-iron found near by and does a large trade in lumber. It was founded in 1634. The population is 9,981.

Thresh'ing Machine', a machine or apparatus for beating out the seed of grain and separating it from the straw. In recent and more perfect machines, besides the grain-conveyer which carries the grain, chaff and short straws by an oscillating motion to the sieves in the shoe, where it is cleaned by the fanblast, there usually are attached operating grain-weighers, measurers, tailings, elevators and baggers, in addition to self-feeders, automatic band-cutters and other mechanically operated and labor-saving devices. The perfection reached to-day by the modern type of American thresher is indicated by the fact that, where driven by an engine of 15 or 20 horse-power, as many as 4,000 bushels a day are threshed, with the best and most satisfactory results in separating the grain from the straw.

Throwing the Hammer. See PUTTING THE SHOT.

Thrush, the common name for any bird belonging to the genus *Turdus*. Thrushes occupy the highest rank in the class of birds. They belong to a large family which embraces about 300 species found in most parts of the world. They usually are fine singers. The eastern hemisphere has a larger number of varieties than the western one. Our familiar robin is a thrush. Of the various thrushes common in the eastern United States all, save the robin, have plain, brown backs and spotted breasts. The wood-thrush is the best known. It is a bird about two inches shorter than the robin, cinnamon brown above with a

WOOD-THRUSH

whitish breast spotted with very distinct dusky spots. As its name indicates, it is a bird fond of woods, but will perch and sing in maples and elms on quiet village-streets. Its voice is flute-like and its song lively and engaging. It nests in woodland and in shrubbery about a house; builds a nest closely resembling that of the robin but somewhat deeper, the materials being leaves, roots, weed-stems, mud, bits of cloth and paper. There are three or four (rarely five), greenish-blue eggs. It is also known as the song-thrush, and corresponds to the song-thrush of Europe, which is a little larger but otherwise like our wood-thrush. The hermit-thrush is a northern bird smaller than the wood-thrush. It seldom nests south of Vermont or northern Michigan, and extends northward to the Arctic regions. It is not often seen, but the song of this shy bird is of rarest beauty. Wilson's thrush or the veery ranges between the two in nesting habits, not extending so far north as the hermit nor so far south as the wood-thrush. It seldom nests south of 40° N. It is one of the smaller thrushes, and utters a song of much sweetness, its voice sometimes being heard at night. The brown thrasher, also called brown thrush and ground-thrush, is the "merry, brown thrush sitting up in a tree." This bird is longer than the robin, of slender build, red-brown above, underneath white spotted with dark brown; its tail is very long. In the manner of using the tail to

give expression to its feelings it shows itself a true cousin to the wrens, but variously shows relationship to the true thrushes. This bird is widely distributed, a familiar summer resident, its joyous song familiar and well-prized. The nest is built in the ground or in a low bush. It is a bulky structure of twigs, rootlets and leaves lined with horse-hair and feathers. The brown thrasher is accused of being a fruit-thief, but in return for tribute levied he destroys many baneful insects. The jolly lay is poured forth from topmost branch of thickset haunt.

Thucydides (*thū-sĭd'ĭ-dēz*), the great historian of the Peloponnesian War, was an Athenian, born probably in 471 B. C. He owned gold-mines in Thrace, and was one of the few who recovered from the terrible plague at Athens. He was in command of an Athenian squadron in 424, when summoned to Amphipolis to save it from falling into the hands of the Spartans, but arrived on the evening of the day on which the place surrendered. For this failure Thucydides was exiled. According to his own account this exile lasted 20 years. It seems certain that he died a violent death, but when or how is not known. Hardly any literary work has received higher praise than the great work of Thucydides. It is remarkable for its truthfulness and for the short, simple and realistic way in which he has recorded facts that must have taken months to gather, sift and decide upon. Macaulay repeatedly said that no historian need ever hope to equal Thucydides. See Fyffe's *Primer of Greek History*.

THUCYDIDES

Thug, meaning a cheat, is the name of a religious brotherhood in India, which in honor of the goddess Kali commits murders and lives chiefly from the plunder got from its victims. Thugs usually band in gangs of ten to fifty or more, and travel, if wealthy enough, on horseback with tents, under the guise of traders. Each gang has its leader; its teacher; its entrappers; its stranglers; and its grave-diggers. They inveigle travelers to join them on the plea of safety, or lie in wait for them. When the victim is strangled and robbed, his body is buried in an out-of-the-way place, and is sometimes mutilated. Thugs also infest the rivers. They are superstitious, and never commit murder unless all omens are favorable. It was not till 1831 that energetic measures were taken to stop these practices, but thuggee, as it is called, has not yet wholly disappeared.

Thur'man, Allen Granbery, an American statesman, was born at Lynchburg, Va., Nov. 13, 1813. When six years old, his family moved to Ohio. He became a lawyer and was chosen a representative in the 29th Congress. In 1851 he was made judge of the supreme court of Ohio, serving as chief-justice from 1854 to 1856. He ran for governor of Ohio in 1867. During his two terms as United States senator (1869–81) he was one of the ablest and most prominent members of that body. In 1888 Thurman ran for vice-president on the Democratic ticket with Cleveland. He died on Dec. 12, 1895.

Thyrsus (*thĕr'sŭs*), a compound raceme or panicle in which a compact, pyramidal cluster of flowers is formed, as in the lilac or a bunch of grapes. See INFLORESCENCE.

Ti'ber, a famous Italian river, rises in the Apennines, passes through Rome, and falls into the Mediterranean by two mouths near Ostia, after a course of 230 miles. Between Lodi and Passo del Forello are rapids, and here the river runs through a narrow gorge for several miles. The Tiber is navigable for ships to Rome, 18 miles from its mouth, where it is 500 feet wide, and for boats of light draught to the mouth of the Neva, 72 miles further up. The Tiber has always been noted for its yellow color, which comes from the yellow clay through which it passes. Besides Rome, the chief city on its banks is Perugia. Steps have been taken to deepen and otherwise improve the Tiber's course.

Tiberius (*tī-bē'rĭ-ŭs*), emperor of Rome, was born on Nov. 16, 42 B. C. As the stepson of Augustus he was adopted by that emperor, and saw service at the head of the legions on the outposts of the empire. He was popular with Augustus, the soldiers and the people, and was married to Julia, the emperor's daughter. He ascended the throne in 14 A. D., and, according to Mommsen, was the best of the emperors. Tacitus grossly misrepresented his character and life. When power fell into the hands of Ælius Sejanus, a Roman knight and a commander of the Prætorian guards, a man of ability, Sejanus ruled well, though he murdered leading citizens, pouring tales of conspiracy into the ears of Tiberius. But Sejanus could not hide his ambition to become emperor in name as well as fact, and fell in 31 A. D. There has been an almost complete reversal of the unjust verdict of history on Tiberius. It is recognized that he ruled the people well, though the Roman court suffered injustice at his hands in retaliation for the disloyalty of the old aristocracy. Consult Mommsen's *Roman Provinces;* Beesley's *Catiline, Clodius and Tiberius;* Duruy's *History of Rome;* and Tarver's *Tiberius.* It was in the reign of Tiberius that Christ was crucified at Jerusalem. The emperor died on March 16, 37 A. D.

Tibet or **Thibet** (*tĭb'ĕt*) is the south-eastern portion of the vast central plain of

Asia, between 28° and 36° N. and 79° and 103° E. It lies between Chinese or East Turkestan on the north; China proper to the east; Bhutan, British Hindostan and Nepal on the south; and Kashmir in the west. Thus it extends eastward from the Pamirs (*q. v.*) between the Himalayas and the Kwen-Lun Mountains to China. Strangers having been jealously excluded, wide regions remain unexplored.

Area and Surface. Estimates of the area vary from 463,200 to 812,000 square miles, the true area probably being over 700,000 square miles, while the population is variously reckoned as 2,250,000 or 6,500,000, though it more likely is about 4,500,000. The extreme length is 1,600 miles east and west, the breadth from 150 miles in the west to 700 in the east. The country is the largest and loftiest tableland on the globe. The Himalayas shut it in on the south, the Kwen-Luns on the north. The Karakoram and its spurs traverse the west, separating Tibet from Kashmir, while the Yun-Ling Mountains on the east part China and Tibet. The plateau is not level, but is dotted with peaks and ranges, 20 heights being higher than the loftiest Andes and the general height of the plains 10,000 to 17,600 feet above the sea, while the mountains rise almost equally above these plains. The Kwen-Lun sends numerous outrunners south into the plateau; eastern Tibet is traversed by somewhat parallel ranges; and in the south Hedin (*q. v.*) has discovered a range 2,000 miles long, hitherto unknown, running about west and east.

Drainage and Climate. Tibet is a mother of mighty rivers. The Brahmaputra (*q. v.*), Hoang-Ho, Indus, Irawadi, Salwin, Sampu, Sutlej and Yang-Tze-Kiang all rise in Tibet. The Karakoram Mountains enclose a valley drained by the headwaters of the Sanpu and Indus (*q. v.*), the basin of the former being Tibet proper, that of the Indus forming Ladak and Bultistan. North of the Karakoram is the large desert called Katchi in the east and Khor in the west. The Yang-Tze (*q. v.*) in the east drains the tract named Khan. The Hoang-Ho (*q. v.*) rises in the hill-country of Lake Kokonor in northeastern Tibet. Large lakes are numerous throughout the country. In the north and west the enclosed plains form poorly watered, inland drainage-basins and contain saline lakes. Tibet's extreme elevation, though it lies approximately between the latitude of Constantinople and that of New Orleans, gives it almost arctic winters. The mountains and plains rob the air of moisture on its inland journey from the oceans, whose nearest point, the Bay of Bengal, is hundreds of miles away. So the climate is excessively dry, the fluctuations of temperature great and sudden, and the northern winds in winter biting to the bone. Timber never rots, meat never spoils, wood becoming brittle and flesh drying until it can be powdered. Among the mountains huge glaciers abound, one, 32 miles long, being four times the size of Switzerland's world-famous *Mer de Glace.*

Resources. The plains, like the *steppes* of Russia and Central Asia, are used for grazing, but vegetation is scant and is that of deserts and of alpine regions. Green meadows occur only along streams, but forests of birch, coniferous trees and poplar exist on the mountains of eastern Tibet. Wild beasts abound in watered districts, and antelopes, wild asses and yaks or Tibetan oxen are numerous on the *steppes.* The fertile valleys produce fruits and grains, barley and other cereals, as, also, pulse and vegetables being grown, and some favored regions even yielding peaches and grapes. The domestic animals are the sheep and yak, but in some regions there are buffalo, camels and swine. Irrigation is necessary, and terraces are built along slopes to retain water. Borax, copper, niter, salt, silver, sulphur and tin abound; there are considerable quantities of gold, borax, gold and salt being the minerals most worked; but lack of fuel makes the development of mineral wealth slow.

Inhabitants and Industries. The people belong to a semicivilized Mongolian race akin to the Burmans. They are industrious, intelligent, and skilful. Their language is not unlike Chinese, but is written in characters that express many syllables. The northern Tibetans are nomadic, but the southern ones live in houses, building them of stone or sun-dried brick. Polyandry, the marriage of one woman to many men, prevails among the lower classes. Courts of justice exist, but the ordeal or the lot often decides doubtful cases, and even torture is used in criminal cases to obtain evidence. Local conditions decide what occupations can be pursued, and in some places agriculture is carried on, whereas in other places only pastoral pursuits can be followed. Though the industries are not important, wool-spinning, weaving and knitting are common and many hands have skill in making images and decorations for temples. The people are ingenious jewelers, and make fine fabrics of goat's hair and wool. A large literature, mainly religious, has accumulated, and printing has been practised for centuries. There is a large trade with Turkestan and China; considerable traffic crosses the Indian frontier; and furs, gold, musk, precious stones and wool are exported.

Government and Religion. Tibet is a theocracy, the church being the state and the priests the real rulers, though China is the suzerain of Tibet. Chinese authority is represented by two officers, who, respec-

tively, have charge of foreign relations and of military matters; by three commanders of the permanent Chinese garrison (about 4,600 men) at Dingei, Lhasa and Shigatse; and by a few other officials. But the administration is almost wholly in Tibetan hands. The religion is that form of Buddhism (*q. v.*) which is called Lamaism, but beside it exist the superstitions of shamanism. The priests, called *lamas*, are exceedingly numerous. At their head is a high-priest, the *Dalai Lama*, who lives in a palace near Lhasa, rules through a priest appointed for life by the Chinese government as a minister, and claims to be the head of the Buddhist world. The priests have superbly decorated temples, and their monasteries, containing thousands of inmates, resemble populous towns. The organization and ceremonies of Lamaism are so like those of the Roman church that Huc and Gabet, French missioners to Tibet in 1844–6, thought Satan had made it in mockery of the Christian church.

History. Tibet, with Korea and Abyssinia, has been a hermit among nations. About Christ's time Sakya, the Hindu Buddhists' last great teacher, settled at Lhasa (*q. v.*), where it is thought that he lives yet in the Dalai Lama. But the historical and formal entry of Buddhism really occurred in A. D. 622,—the very year Mohammed left Mecca. In 821 Tibet paid tribute to China. Western Tibet was overrun by Turks, till Aurungzeb in the 17th century expelled them. Odorico, an Italian friar, visited Tibet in 1328; Andrada, a Portuguese Jesuit in 1534; and Capuchin missionaries in 1708–44. Tibet became a dependency of China in 1720. The priests enforced strict exclusion of all foreigners who were not Buddhists. Russia gained influence in Tibet about 1890. In 1890 and 1893 England made Tibetan treaties with China to remove hindrances from Indian trade with Tibet. The Tibetans failing to observe the terms of the treaty, Britain in 1903–4 sent a military expedition to Lhasa. Its commander concluded a treaty with the Tibetans themselves which removed all causes of friction, the latter paying an indemnity and the English evacuating Chumbi Valley in 1908. No Tibetan territory may be sold, mortgaged or leased to any foreign power without English consent, nor Tibetan public works or affairs be subject to foreign interference or management. China assented to this in 1906, and Russia and Britain agreed in 1907 to negotiate with Tibet only through China and to send no representative to Lhasa. Consult Huc's *Recollections of a Journey to Tibet;* Landon's *Opening of Tibet;* and Landor's *Tibet and Nepal.*

Tick, a kind of mite having the mouth in the form of a sharp beak. Birds and mammals suffer especially from it. They are very common in warm countries and are parasites on cattle. The so-called sheep-ticks are insects with six legs, while all true ticks have eight legs, like the spiders. They live on plants and will attach themselves to the skin of man as well as to animals. The wood-tick is common in our woods in certain sections. Squirrels, rabbits, pigeons and chickens, — each is affected by a special tick. Eight species are found upon cattle in this country, and diseases of cattle are transmitted by the cattle-ticks. Those of South Africa and Brazil are dreadful pests. In South America they cling in clusters of hundreds to slender twigs, and transfer themselves to horses and cattle. They bury their heads under the skin and suck blood, becoming as large as a horse-bean. Herds of cattle are sometimes killed by the exhaustion produced by these parasites. Wet weather is fatal to them, and infested animals are often freed from them by swimming a river.

Tick'nor, George, an American author, was born at Boston, Aug. 1, 1791. He graduated at Dartmouth College when 16, and studied law. In 1820 Ticknor became professor of French and Spanish in Harvard College. His *History of Spanish Literature* was published in 1849, at once took high rank, and was translated into Spanish, German and French. His *Life of Prescott* is considered one of the finest biographies ever written. Ticknor died on Jan. 26, 1871. See *Life* by Hilliard.

Ticonderoga (*tī-kŏn-dĕr-ō'gȧ*), a village of New York at the outlet of Lake George, 88 miles northeast of Albany. Population 1,911. The French in 1755 built Fort Carillon here, afterward called Fort Ticonderoga, to command Lake Champlain. Two years later Montcalm led his force of 9,000 men from this fort and captured Fort William Henry, which had been built by Sir William Johnson at the southern end of Lake George. In 1758 General Abercrombie was defeated by its garrison with a loss of 2,000 men; but next year General Amherst forced the French to dismantle and abandon it. After the battle of Lexington Ethan Allen (*q. v.*) stormed Ticonderoga on May 10, 1775. Next year Burgoyne, by planting a battery on Mount Defiance, forced the American garrison to leave Fort Ticonderoga, which the British held until Burgoyne's surrender, though it was attacked by General Lincoln. The British also held it a short time in 1780. Parts of the walls are still standing. See Joseph Cook's *History of Ticonderoga.*

Tides, the periodic rising and falling of the waters of the sea along coasts and inlets. The rising is called the *flood*, and when highest is called *high water;* the falling is called the *ebb*, and at its lowest is known as *low water.* The short lull between tides is called *slack water.* Flood-

tide and ebb-tide each last approximately six hours, there being two high and two low tides daily. Each day high water occurs 52 minutes later than the day before, as the average time between two high or low tides is 12 hours and 26 minutes Sir Isaac Newton first discovered the cause of the tides by applying his newly discovered law of gravitation, showing that the rising of the waters is due to the difference between the attraction of the moon and of the sun upon the earth as it revolves. As the particles of water are free to move while the particles of land are not, this attraction draws them toward the moon, forming a swell in the ocean's waters. This swell draws toward it waters from both sides, leaving on the coasts a depression, or low water. Gravitation acts on the solid mass of the earth as if this mass were concentrated at the center of the globe. So on the side of the earth opposite that of the moon the waters are less attracted than the land, being at a greater distance, and are as it were, left somewhat behind, thus forming another swell, just opposite to the one in the other hemisphere. By the rotation of the earth this system of swells and troughs travels from east to west over every part of the ocean. The attraction of the sun also causes two daily tides, but these solar tides are much smaller than the lunar tides. As the moon and sun rarely are in the same relative positions, their high tides do not usually occur at the same time. But at new moon and full moon they are in line with the earth and their attractions act together, causing especially high water, known as the *spring tides*. At the time of the first and of the third quarter of the moon, it is at right angles with the sun, and their attractions act against one another, lessening the height of the high water. These are the *neap tides*.

A complete explanation of the tides cannot be given in this place. For this the student is advised to read Sir Robert Ball's *Time and Tide* in the Romance of Science Series; articles 464–84 in Young's *General Astronomy;* Francis Darwin's *Tides*, popular lectures before Lowell Institute; and, lastly, his masterly article on *Tides* in the *Encyclopædia Britannica*.

In the references just given the tides are treated as a wave-motion, which they really are. This is the only point of view from which they can be satisfactorily considered. See WAVE-MOTION.

Tien=Tsin (*tē-ĕn'tsēn*), a large city of China, is on Pei-ho River, 38 miles from its mouth and 80 southeast of Pekin. The old mud and dried-brick houses have been replaced in part by well-built dwellings. The Pei-ho is generally frozen from the middle of December to the middle of March, and business, at other times carried on by means of boats and junks, is then done by sledges which swarm on the river. Tien-Tsin is an open port; it exports large quantities of cotton, peas and dates and imports cotton-goods, needles, window-glass, sugar and paper. Population 750,000.

Tierra del Fuego (*tĕĕr'ra dĕl fwā'gō*), "Land of Fire," is a cluster of islands at the southern end of South America, with the Straits of Magellan between them and the mainland. They are small, mountainous islands, with many peaks over 5,000 feet high, covered with perpetual snow, while the lower slopes bear forests of beech. The island proper is Tierra del Fuego, 300 miles long. Cape Horn is the southern end of a small island of the group. The natives belong to the Patagonian race; build cone-shaped huts of branches of trees stuck in the ground with a hole for a door; dress in sealskins; and feed largely on shellfish. The climate is very variable, with storms, wind, rain and snow in close succession. The islands were discovered by Magalhaes (Magellan) in 1520, and named from the fires seen at night along the shores. They are nominally divided between the Argentine Republic (*q. v.*) and Chile (*q. v.*). See PATAGONIA.

Tif'fin, O., county-seat of Seneca County, is 34 miles by rail southwest of Sandusky, on Sandusky River. It is the seat of Heidelberg University, founded in 1850. There also are two daily and four weekly newspapers, a courthouse, three banks, sixteen churches, a convent, several schools and two libraries. It manufactures carriages, stoves, furniture, tiles, farming implements, and has potteries, glass-works, straw-board, emery-wheel and iron works, planing, flour and woolen mills and shoe-factories. Tiffin has the service of four railroads, and near the city are deposits of clay and glass sand. Population 11,078.

Tiflis (*tyĕ-flyĕs'*), an important city of Asiatic Russia on Kur River, 165 miles east of the Black Sea. It is the capital of the Russian government of the same name in Transcaucasia, and is on the military railroad which joins the Black and Caspian Seas. It has a large trade with Persia, and manufactures woolen and linen cloth, carpets and arms. It is noted for its warm-spring baths. Population 159,590.

Ti'ger, the largest and most powerful member of the cat family. The lion appears larger on account of its immense hairy head and mane, but the royal Bengal tigers reach a length of 11 feet and are able to overcome the lion in combat. They have a tawny ground-color, with black stripes on the body and limbs, the tail being ringed with black, the coloring closely resembling that of the herbage. The common tiger is about eight feet in length. It is abundant in Hindustan, does great damage to herds of cattle, and occasionally attacks man.

The tiger's jaws and teeth crush the large bones of a buffalo, and it can break a horse's back with one blow of the forepaw. It is audacious, cunning, treacherous, the fiercest and most bloodthirsty of beasts. The kittens are about a foot long when born; they remain with the mother until the third year. The tigress teaches the young how to find and kill prey. They stalk their prey, and also spring upon it

TIGER

from ambush. A cattle-eating tiger will kill an ox about every five days or from sixty to seventy in a year. Hunting the tiger from the backs of elephants is dangerous and exciting. The range of the tiger is greater than was at first supposed. Starting with India as its chief locality, it ranges west through Persia, east through Burma to Sumatra and Java and north through China to Manchuria and even into Siberia. It is absent from Ceylon and Borneo.

Tig'lath Pile'ser. See ASSYRIA.

Ti'gris, a large river of Asiatic Turkey, rises south of Lake Goljik in the Kurdish Mountains, is joined at Til by the Bitlis, unites with its sister-stream, the Euphrates (*q. v.*), at Korna, and from this point to the Persian Gulf is known as the Shat-el-Arab. Its whole course is some 1,500 miles long. In its upper part it is a very swift stream. The Tigris in ancient times was the great river of Assyria, and formed the eastern border of Mesopotamia. Nineveh, Seleucia and Ctesiphon stood on its banks. Its chief cities now are Baghdad, Mosul and Diarbekir. It is navigable for steamers at all seasons below Mosul.

Til'den, Samuel Jones, was born at New Lebanon, N. Y., Feb. 9, 1814. He went to Yale College and the University of New York, and became a lawyer. As a member of New York Assembly in 1846 he was much interested in the state canals, and became one of the leading Democrats of the state. In 1874 Tilden was elected governor by 50,000 majority, and his popularity, thus shown, gave him the Democratic nomination for the presidency in 1876. The Hayes-Tilden campaign was one of the hardest-fought and closest in our history, and the disputed election was given Hayes by the electoral commission of 15 appointed by congress to canvass the votes. Tilden also was a prominent lawyer of New York City. He was one of the organizers of the bar-association, and was leading counsel in many large cases. He died near Yonkers, N. Y., Aug. 4, 1886, leaving the bulk of his fortune to found a free library for New York City. See NEW YORK LIBRARY.

Tiles. A tile is a slab of baked clay, used for covering roofs, paving floors, lining furnaces, constructing drains and for decorative purposes. The general process of manufacture involves prepafing, mixing, molding and firing the clay, after which it may be polished. Fire-proof and structural tile is coming into extensive use; there are three classes: dense, porous and semiporous. The latter two are made by mixing the clay with straw, sawdust or fine coal. The porous tile can be nailed to and cut with a saw. The decorative value of tiling is seen chiefly in flooring. The body of the tile is made of one color of clay and the inlaid pattern of another. Many times figures are put on in slight relief. Tiles made in Cairo and Damascus in medieval times are of such beauty that squares of nine or sixteen are often sold for many hundreds of dollars.

Til'ley, Sir Samuel Leonard, was born in New Brunswick in 1818. He was a member of the Executive Council of New Brunswick from 1854 to 1856 and from 1857 to 1865, from 1866 until the Union holding the office of Provincial Secretary. He was frequently a delegate to England; a delegate to the Charlottetown and Quebec Conferences in 1864 and to the London Colonial Conference in 1866. He was Minister of Finance on two occasions, and was Lieutenant-Governor of New Brunswick from 1873 to 1878. He was returned to the House of Commons in 1878 and re-elected the following term. When a private member he carried the prohibitory liquor-law through the New Brunswick Assembly. He is one of the fathers of Canadian federation.

Till'man, Benjamin Ryan, was born in Edgefield County, South Carolina, on Aug. 11, 1847. He was educated at Bethany Academy, but his studies were interrupted by the Civil War. He joined the Confederate army in July of 1864, but a severe sickness cost him an eye and invalided him for two years. During the time fo reconstruction (*q. v.*) he was active ni promoting education and became politically prominent, but followed farming as his sole pursuit until 1886. Then he was a leader of the agitation for educational, industrial and other reforms and in the opposition of the Democratic

masses in South Carolina to the domination of the aristocratic elements in the party. Mr. Tillman advocated the formation of a Farmer's Alliance, of Clemson Agricultural College (at Calhoun's old home) for boys and of Winthrop Industrial College for girls, each of which is the largest school of the kind in the south. In 1890 and in 1892 the Farmer's Alliance elected him governor. He instituted the dispensary system of selling liquor under state control; and was the central figure in the constitutional convention (1895), which enacted South Carolina's educational qualification for suffrage. In 1895 and 1901 he was elected to the United States senate.

Tillman, Samuel Escue, American soldier and educator, astronomer and chemist, was born near Shelbyville, Tenn., Oct. 2, 1847, and graduated at West Point, entering the army first as an artilleryman and afterward was transferred to the corps of engineers. In 1870 he was appointed assistant-professor of chemistry, and ten years later became professor of chemistry, geology and mineralogy at West Point; was assistant-astronomer of the United States expedition to Tasmania to record the transit of Venus; and has acted on several survey commissions and explorations for the United States government. He is the author of a number of textbooks in his branch of science, notably a work on *Descriptive General Chemistry*, and elementary treatises on mineralogy, on the principles of chemistry and lessons in heat.

Til'ly, Johann Tserclaes, Count of, one of the greatest captains of the 17th century, was born in 1559 in Brabant. A pupil of the Jesuits and an officer under the duke of Alva, he developed into a soldier of great sternness. After fighting against the Turks, he was made commander of the Holy Roman Empire's army on the outbreak of the Thirty Years' War (*q. v.*), and with Maximilian of Bavaria gained the important battle of Prague. During the course of this war his masterly tactics separated the armies of Mansfeld and the Markgraf of Baden, beat the latter at Wimpfen, and drove Christian of Brunswick from the Palatinate, defeating him at Höcht in 1622 and again next year, in a desperate three days' battle at Stadtlohn. Now made a count of the empire, he defeated the king of Denmark at Lutter and, with Wallenstein, forced him to sign the treaty of Lübeck in 1629. Two years later he succeeded Wallenstein as commander-in-chief of the imperial troops, took Magdeburg by storm, and allowed his Croats and Walloons to pillage and massacre at pleasure. A few months later he met his match in Gustavus Adolphus, who defeated him at Breitenfeld and next spring forced him to retreat behind Lech River in Bavaria, crossing it himself in the face of Tilly's army. In this last battle Tilly was mortally wounded and died on April 30, 1632. Tilly was temperate, despised luxury and wealth, and his able support of the Roman Catholic party in the war was not due in the slightest to self-interest, but wholly to his devotion to the church.

Til'sit, The Treaty of, was a celebrated pact made by Napoleon I of France, and Alexander I of Russia in 1807. The emperors met on a raft at the center of Niemen River on June 25th; and a treaty of peace was concluded on July 7th. France and Russia made a secret agreement by which Russia was to aggrandise herself at the expense of Sweden and Turkey; and France in the west of Europe. A passive partner to the treaty was the subjugated kingdom of Prussia, which was forced to close her ports to English vessels, pay an indemnity, reduce her army to a nominal footing, and leave her fortresses as security in the hands of the French. The dominions of Friedrich Wilhelm III of Prussia were reduced one half.

Timbuktu (*tĭm-bŭk'tōō*), a city on the southern edge of the Sahara, in central Africa, some nine miles from the Niger. It is about three miles around, and formerly was surrounded by a clay-wall. Timbuktu has a large caravan-trade, gold-dust being the most important export. The people are negroes, Tuaregs, Mandingoes, Arabs and Fulahs. The city was founded in the 12th century, but was first seen by a white man in 1826. Timbuktu now belongs to France, and a railroad is proposed to connect Algiers, Timbuktu and Senegambia. It already is connected by steamer with Koulikoro. Population 12,000, greatly increased during the trading-season from November to January. See NIGERIA and SENEGAL.

Tim'by, The'odore Rug'gles, inventor of the *Monitor* (*q. v.*) was born in Dover, New York, 1822, and from childhood was an inventor. He was the first to suggest the modern use of iron in warships. In 1841 he exhibited, and in 1843 patented, a model and plans of a revolving battery to be made of iron. In 1861 he entered into an agreement with the builders of the *Monitor*, of which Ericsson (*q. v.*) was the constructing engineer, for the use of his invention. It has been mistakenly credited to Ericsson, but Timby's claim was never officially disputed. It is he who revolutionized the building of modern warships.

Time, like space, is one of the conditions under which all things are perceived. Time may be defined as *duration*, but it is doubtful whether anything is thereby added to the idea which every one already has as to the nature of time. Our notion of time as a quantity is derived from the observance of some regularly recurring event, such, for instance, as the vibration of a pendulum. In such a case we say that the "amount of time" elapsing between two events is pro-

portional to the number of vibrations which the pendulum has made between the two events. The unit of time employed by the whole world is the *average* time which elapses between two successive transits of the sun across the meridian. This unit is called the *mean solar day*, and is divided into 86,400 parts called *seconds*, which are the units most frequently employed in measuring small intervals of time. The sun does not move through the sky at a uniform rate; but we can imagine one which does, and makes the same number of revolutions per year as the actual sun. Such a sun is called the *mean sun*. The instant at which the mean sun crosses any meridian is called *noon* for that meridian or *local noon*. Time which is measured from a local meridian is called *local time*.

Since 1883 the United States have employed time which is counted from Greenwich noon, and is called *standard* time. Thus the inhabitants of Labrador and Nova Scotia employ time which differs from that at Greenwich by *exactly four hours;* this is called colonial time. In the extreme east of the United States, neighboring on each side of the 75th meridian, all correct watches and clocks differ exactly five hours from Greenwich time; this is called *eastern time*. In the Mississippi valley the time is six hours later than Greenwich, and is called *central time*. Fifteen degrees west we have *mountain time;* and along the Pacific coast the time is eight hours later than Greenwich and is known as *Pacific time*. *Middle European time* is one hour faster, and *Eastern European time* is two hours earlier, than Greenwich. Recently the Australian states have adopted Greenwich time — or, what amounts to the same thing, they use time which differs exactly eight, nine, ten and eleven hours from Greenwich.

Tim'othy, a disciple and companion of St. Paul. He was the son of a Greek and a Jewess, and his home either was at Derbe or at Lystra, in Lycaonia. Paul set him apart as a minister of the gospel. After preaching in Macedonia and Achaia he went at Paul's request to Ephesus, and accompanied the apostle to Jerusalem. It was to him that the two *Epistles to Timothy* were addressed by Paul. According to tradition, Timothy suffered martyrdom under Domitian.

Timur (*tē-mōōr'*) or **Tamerlane** was the second of the great conquerors whom central Asia sent forth in the middle ages, and was born at Kesh, about 40 miles southeast of Samarkand, April 9, 1333. His father was a Turkish chieftain and his mother claimed descent from the great Genghis Khan. When he became tribal chieftain, Timur helped Emir Hussein to drive out the Kalmucks. Turkestan was divided between them, but war broke out between the chiefs, and the death of Hussein in battle made Timur master of all Turkestan. He now began his career of conquest, overcoming the Getes, Khiva and Khorassan, after storming Herat. His ever-widening circle of possessions soon embraced Persia, Mesopotamia, Georgia and the Mongol state of Kiptchak. He threatened Moscow, burned Azov, captured Delhi, overran Syria, and stormed Baghdad, which had revolted. At last, July 20, 1402, Timur met Sultan Bajazet on the plains of Angora, captured him and routed his army, thus becoming master of the Turkish Empire. He took but a short rest at his capital, Samarkand, and in his eagerness to conquer China led 200,000 men across the Jaxartes on the ice, and pushed rapidly on for 300 miles, when his death, Feb. 18, 1405, saved the independence of China. In his reign of 35 years this chief of a small tribe, dependent on the Kalmucks, became the ruler of the vast territory stretching from Moscow to the Ganges. He was an able administrator, had traits of statesmanship, and patronized science and art. A number of writings said to have been written by Timur have been preserved in Persian, one of which, the *Institutions*, has been translated into English. Timur is made the hero of Marlowe's *Tamburlaine*, the first play in which blank verse appeared on the stage. The name of Tamerlane means Timur the Lame.

Tin, a silvery-white metal, with a tinge of yellowish blue and a high luster. It is softer than gold and can be rolled or beaten into very thin sheets called tinfoil. It is ductile at 212°, when it can be drawn out into wire which is not very tenacious; it melts at 455°; and volatilizes at a white heat. Air and moisture act on tin very slightly. The peculiar properties of tin, especially its malleability, its brilliancy and the slowness with which it rusts, make it very serviceable. With other metals it forms valuable alloys, as bronze, gun-metal, bell-metal, pewter and solder. Tin is very largely used in covering sheet-iron, thus forming tin-plate. Tin must have been one of the metals earliest known, as it enters into bronze of which the oldest metallic weapons and tools are made. The largest tin-mines of Europe are found in Cornwall in England, which once supplied Tyre and Sidon. There are very large tin-deposits in the island of Banka and on the Malay Peninsula, as well as in Australia. The Spanish-Portuguese and the Saxon-Bohemian mountains yield tin. Some tin is found also in Bolivia, Peru, Mexico, India and Chile. Small deposits of tin-ore have been found in the United States, but we are wholly dependent upon foreign sources for our supply of this metal. In 1906 the world's production was 96,196 long tons. Dioxide of tin is the only important ore; when pure it is made of 78 parts of tin and 22 of oxygen. This ore is gray, yellow, red and black and strikes fire

with steel. In Cornwall tin-ore is found in veins running through granite and slate, or scattered in crystals through their mass. The dressing of the ore is a hard and delicate operation. It only yields from ten to 84 pounds of tin-oxide to a ton of material, and is so scattered through the mass that it has to be stamped to a fine powder to separate it. It is then repeatedly washed by machinery to rid it of impurities, is passed through a furnace to separate the sulphur and arsenic, and is then ready for smelting.

Tin'dale, William, an English reformer, was born in Gloucestershire about 1490. He studied at Oxford and Cambridge, and in 1523 began his translation of the New Testament in London; but his sympathy with the Reformation becoming known by his bold speech, he had to flee, going to Hamburg for a year. The first ten sheets of his New Testament were printed at Cologne, and in 1525 at Worms two editions were published without his name. This was the first English printed copy of the New Testament. There was a great demand for it, in spite of the prohibition of the clergy and the abuse of such men as Sir Thomas More, (*q. v.*), who wrote against Tindale. The fifth edition was published in 1529, and in 1534 a revised edition came out with Tindale's acknowledgment of his work. He also brought out a translation of the Pentateuch, or first five books of the Bible, and wrote *The Obedience of a Christian Man.* Various plots had been made to arrest him, after the first issue of his Testament, and at last officials of the Holy Empire succeeded in having him taken at Antwerp, where he was imprisoned for 18 months and then executed, by strangling and burning, at Vilvorde, near Brussels, Oct. 6, 1536. In November, 1866, a memorial to him was erected at his birthplace in Gloucestershire. The King James' version (1611) of the Bible is based on the translations by Tindale. See *Life* by Demaus.

Tintoretto, Il (*ēl tĕn-tō-rĕt'tō*), a great Venetian historical painter, was born in 1512. His real name was Jacopo Robusti, but he was called Tintoretto from the Venetian word meaning dyer, which was his father's trade. He was self-taught, except for a few lessons from Titian. He took as his motto: "The design of Michael Angelo and the coloring of Titian." He sketched so fast that he was called The Madman. Among his famous pictures are *Belshazzar's Feast,* a fresco, *The Last Supper, The Last Judgment, The Slaughter of the Innocents* and *Paradise.* He died at the age of 82.

Tippecanoe (*tĭp'pē-kà-nōō'*), **Battle of,** an engagement fought on Nov. 7, 1811, on Tippecanoe River in what then was Indiana Territory, over which Wm. Henry Harrison was governor, between disaffected Indians and some 800 militiamen and U. S. troops under Harrison. The cause of the native rising, which was incited by an Indian chief named Tecumseh (*q. v.*) and his brother, "the Prophet," was resentment over the seizure and sale of lands in Indiana Territory, which, the Indians claimed, were inalienably their own. Alarmed at the Indian attitude of menace, Harrison marched to and encamped near the Indian town of Tippecanoe. While there his command was attacked at night by a large force of Indians, who however, were beaten off with heavy loss. Harrison's losses were about 185; but his victory made him so popular that many years afterwards in the presidential campaign of 1840, when Harrison and Van Buren were candidates for the presidency, the war cry of the Whigs was "Tippecanoe and Tyler too!" Tecumseh, though not personally present in the battle, lost his influence in the Territory, and later fled to Canada, where he lost his life in the battle of Moraviantown during the War of 1812.

Tippecanoe, a river of Indiana, which rises in Lake Tippecanoe in the northern part of the state, flows southwest 200 miles, and falls into the Wabash, nine miles above Lafayette. On its banks was fought the battle of Nov. 7, 1811.

Tippoo Sahib (*tĭp-pōō' sä'hĕb*), sultan of Mysore and son of Hyder Ali, was born in 1749. He was brought up a Mohammedan, excelled as an athlete, and learned military tactics from the French officers in his father's service. He proved his prowess by routing the British at Perimbakum in 1780 and on Kolerun River in Tanjore in 1782. After being crowned he returned at once to the head of the army and captured Bednor in 1783. In his second war with the English (1790-92) he wasted the Carnatic almost to the gates of Madras, but was at last forced to give up part of his dominions and make peace. The English again attacked Tippoo in 1799, and while bravely defending his capital, Seringapatam, he was killed (May 4, 1799). Tippoo was very popular among his people, who looked upon him as a martyr to the Mohammedan cause.

Tirlemont (*tēr'l-môn'*), a city in Brabant Province, Belgium, 30 miles east of Brussels. Population 17,850. Here the French general Dumouriez routed the Austrians on March 16, 1793, thus winning a most important battle.

Tiryns (*tī'rĭnz*), one of the very oldest cities of Greece, was in Argolis in the Peloponnesus. According to the account handed down, it was founded by Prœtus, a king of Argolis, and its walls were built by the Cyclopes. Here Hercules passed his boyhood. Probably about 468 B. C. the city was destroyed by the Argives. The ruins are one of the finest specimens of what is called cyclopean architecture, and with those of the neighboring city of Mycenæ

(*q.v.*) are the grandest of all in Greece. The walls were over 20 feet thick, formed of unknown stones of enormous size.

Tissot (*tē'sō'*), **James Joseph Jacques,** an eminent French *genre* painter, famous for his series of pictures representing the life of Christ on earth, painted during a ten years' visit to the Holy Land, was born at Nantes, Oct. 15, 1836. He was educated at *École des Beaux Arts* in Paris and under such masters in art as Lamothe and Flandrin. He made his first appearance in the Paris *Salon* in 1859, with a number of fine water-colors, etchings etc., and in 1861 he painted his *Rencontre de Faust et Marguerite,* now in the Luxembourg, Paris. His other notable canvases include *Return of the Infant Prodigal, Confidence, A Widow, An Interesting Story, The Captain's Daughter, On the Thames, A Young Girl in a Boat* and *A Young Woman in Church.* Tissot then turned his attention to his series of religious subjects illustrating the *Life of Christ,* for which a firm of French publishers, it is said, paid him over a million francs. The series, 365 in number, were painted each on the spot traditionally associated with its subject, and were exhibited in London and Paris, where they won fame for the distinguished artist. The originals are in Brooklyn's Institute of Art. He died on Aug. 9, 1902.

Titans (*tī'tanz*), **The,** in Greek story, were the sons of Uranus (Heaven) and Gæa (Earth). Urged by their mother, the Titans, headed by Kronos, rose against their father, dethroned him, and set free from Tartarus their brothers the Hekatoncheires (hundred-handed) and the Cyclopes. Kronos made himself king, and for fear he should be dethroned by one of his children as it was foretold he would be, he swallowed each as soon as it was born. The only son to escape was Zeus, who was saved by his mother causing Kronos to swallow a stone wrapped in a cloth, believing it to be his child. Zeus at the end of a ten years' war conquered the Titans and hurled them into a dungeon below Tartarus, surrounded by a brazen wall and guarded by the hundred-handed.

Titian (*tĭsh'an*) or **Tiziano, Vecelli,** one of the greatest of painters, was born at Capo del Cadore, Italy, in the Alps of Friuli, in 1477. His father sent him to Venice to study painting when he was ten. He was very quick at reproducing the special features of any artist's work, and sometimes beat his masters. The completion for the Venetian senate of a picture begun by Bellini, who was one of his teachers, gained him fame and an office worth 300 crowns a year. He became acquainted with the duke of Ferrara and Ariosto, the poet, whose portraits he painted, and on his return to Venice painted one of his grandest pictures, the *Assumption of the Virgin.* Pope Leo X and Raphael invited him to Rome, and Francis I to France. He painted the portrait of Charles V, and spent three years in Spain. There is no complete catalogue of Titian's works, but over 600 of his pictures are known. Far beyond his power as a designer and beyond his gifts of imagination are the splendor, boldness and truth of his coloring. He died at Venice in 1576. See his *Life* by Northcote.

Titicaca (*tĭt'ē-kä'kä*), a South American lake, 12,000 feet above the sea. It lies partly in Bolivia and partly in Peru, and is 100 miles long and about 35 broad. Some remarkable ruins on its small islands seem to belong to a higher civilization than was found in the country when it was conquered by the Spaniards. There are pyramids covering several acres and doorways, pillars and statues sculptured in peculiar style. On the cornice of a doorway is a human figure with a crown of rays and crested serpents. The statues were all on a large scale, and the whole region is strewn with the great sculptured blocks. Two steamers ply on the lake, having been carried in pieces across the Andes in 1871, and a railroad from Arequipa to the lake has been built, which opens the country, with its rich stores of silver, copper and timber and its products of chocolate, coffee and alpaca-wool. See ANDES, ARGENTINA, BOLIVIA, CHILE and PERU.

Tit'lark, a class of small birds, coming between the larks and the wagtails. They live in all parts of the world, building their nests of dry grass, lined with hair, on the ground. The American titlark is a little over six inches long, olive-brown, shading to a yellowish-brown and white, with black bill and feet. In the fields or prairies it often is found in flocks of tens or hundreds running on the ground. The Missouri titlark is the American bird which is most like the skylark of Europe.

TITLARK

Tit'mouse, the common name of a number of small birds related to the warblers. There are about 75 species, found chiefly in the Old World. Four species inhabit the eastern United States. The commonest of these is the well-known black-capped chickadee, which is a winter as well as a summer resident in the southern part of its range. This bird is about five inches long, gray above and white below washed with brown. The

crown and throat are black and the cheeks white. Its familiar call is *chickadee*, and besides this it has a high, sweet whistle of two or more notes. It ranges from Labrador to Indiana and Virginia. In the south it is replaced by a smaller southern chickadee. The tufted titmouse is the largest of the American species, being about six and one fourth inches long. All these birds of America are dull-colored, but some of the true Tits of the Old World are among the brightest birds of the northern hemisphere. For example, the azure tit of Siberia is white and sky-blue; the blue tit of Europe blue, white and yellow.

BLUE TITMOUSE, MALE AND FEMALE

Ti'tus, mentioned in the Bible as a companion of Paul, was a Greek sent from Antioch to Jerusalem to confer with the apostles. He traveled with Paul, going with him to Jerusalem, was sent by him to Corinth, and left at Crete, where, according to tradition, he was made its first bishop.

Ti'tus, Fla'vius Sabi'nus Vespa'sianus, an emperor of Rome, was the oldest son of Vespasian, and was born at Rome on Dec. 30 of A. D. 40. Brought up at the court of Nero, he became well-trained in manly exercises and a good scholar. He saw service as military tribune in Germany and Britain and as commander of a legion in Judæa under his father. When Vespasian became emperor, Titus was left to carry on the Jewish war, which he brought to a close by the capture of Jerusalem in 70 A. D. after a long siege. On his triumphal return to Rome he was received with joy by the citizens, and made a fellow-ruler of the empire by his father. On becoming sole emperor, at his father's death in 79, he at once put a stop to prosecutions for acts of disrespect to the emperor; had informers scourged and banished or sold as slaves; completed the Colosseum and the Baths of Titus; and delighted the people with public games which lasted 100 days. In 79, when the great eruption of Vesuvius took place, which buried Herculaneum and Pompeii; in 80, when a three days' fire laid Rome waste; and during the plague that followed it he despoiled his palaces to aid the sufferers. In this way Titus became one of the most popular of Roman emperors, but in the third year of his reign he suddenly died on Sept. 13 of 81 A. D.. See COLOSSEUM, ROMAN EMPIRE and VESPASIAN.

Ti'tusville, Pa., city in Crawford County 50 miles southeast from Erie. In the vicinity are extensive oil-fields. The first oil-well in the world of which there is any record was struck here in August, 1859. The manufactures consist of oil-refineries, paraffine-works, iron and steel works, machine-shops, foundries, radiator, forge and cutlery works, furniture-factories, sash, blind and chair works, carriage and wagon works, a silk-mill, two large chemical-works and wood-specialty work. The city has a full public-school course, from kindergarten through the high school, parochial kindergarten and elementary schools and Saint Joseph's Academy. Benson Memorial Library and Titusville Hospital are noteworthy institutions, and the city has several churches. Water is supplied from artesian wells, and the city has all the adjuncts of a progressive place. Oil Creek, swollen by heavy rains in 1892, flooded the lower part of the city, causing several oil-tanks to give way. The oil spread on the water, became ignited, and caused damage to property and some loss of life. Titusville has the service of two railroads. Population 8,346.

Tivoli (*tĭv'ō-lĭ* or *tē'vô-lē*), a city of Italy, 18 miles east of Rome, stands on the slope of Monte Ripoli, one of the Apennines. It is a walled town, with a fortress, steep, narrow streets and a cathedral, once a temple of Hercules where Augustus held court. Since the time of Pliny its vineyards have been noted for their fine-flavored grapes, and the *travertino* stone, of which a great part of Rome is built, comes from Tivoli. Near the city are the temple of Vesta, built in 76 B. C., the remains of the villas of Hadrian and Mæcenas and the ruins of early Roman mausoleums, baths and aqueducts. Tivoli was in Roman times called Tibur, is mentioned in 446 B. C., and is said to be older than Rome. It is one of the few towns of Latium still on their old sites. It also was a noted suburb of Rome, Scipio, Marius, Horace and many other prominent Romans having Tiburtine villas. Population 12,880.

Toad, an amphibian animal related to the frog, having a similar structure and life-story. The skin is covered with warts, but the milky secretion is harmless. Toads are more terrestrial than frogs; after they become mature they return to water only to lay eggs, while frogs always remain near the water. Their eggs can be distinguished from those of frogs from being laid in long strings instead of masses of gelatinous substance. The toad is often used for making nature-observations in schools, and is an excellent subject for study. Hodge in *Nature-Study and Life* says: "No aquatic egg is better adapted for such use [study in school-room]. It is large enough to be seen with the unaided eye, develops under all sorts of conditions, and the progress is so rapid that interest is sustained to the end. First the egg elongates, then the tiny, flat tadpoles hatch and, feeding first on the gelatinous matter of their envelope, soon begin to eat the slime in the aquarium and grow with

great rapidity; hind legs appear, fore legs come, the tail is absorbed, and the little toads emerge from the water — all within little more than a month from the time the eggs are laid." The aquarium should have about two inches of moist earth in the bottom and the toads should be fed with a wide variety of insects or bits of fresh meat. The toad is a good friend to man in that it destroys such numbers of insects. Hence it is valuable in the garden. Toads seek moist, shady places and may be found under boards, stones and leaves. The toad has too long been looked upon with superstition and aversion, grown people as well as children agreeing in putting out of the way all toads come upon; in reality, they are harmless, of great benefit to man, and should be protected. The song of the toad, the piping of the male in the spring, is a pleasant sound, called by Hamilton Gibson a "drowsy drool that brings your feet to loitering in the deepening dusk." Consult Kirkland's *Habits, Food and Economic Value of the American Toad.*

Toad'stool. See BASIDIOMYCETES.

Tobac'co, species of *Nicotiana*, a genus of the nightshade family. *N. tabacum* is the best-known species, but *N. rustica* is also much cultivated. The *latakia* of Syria and the commonly cultivated tobaccos of Cuba, the Philippines and the United States belong to *N. tabacum.* Turkish and Hungarian tobacco belong to *N. rustica.* Common tobacco (*N. tabacum*), grows from two to eight feet high. Its leaves are lanceolate, oblong or ovate in shape, from 12 to 42 inches long and eight to 24 wide. They are in turn so attached to the stem that the first is below the ninth and the second under the tenth. A hundred varieties of common tobacco are cultivated, distinguished by color, shape, size and texture of leaves; by fitness for different soils and uses; by different colors in the plants during growth; and by other points. Some ripen in six weeks, others are slow to ripen. Tobacco was introduced to the civilized world by the discovery of America, where the natives were found using it. The valuable properties are found in the leaves, which are dried and cured. More tobacco is produced in the United States than in any other country, but it supplies less than half the tobacco of commerce. Five leading types are grown in this country. Seed-leaf tobacco includes all tobacco for cigars, and is raised in the Connecticut and Housatonic valleys, Florida, Miami Valley, northern Illinois, some counties of central New York, southern Wisconsin and the Susquehanna valley of Pennsylvania. White Burley tobacco is mainly used for making plug and fine-cut chewing tobacco and the lower grades of pipe-tobacco. There also are heavy or dark tobacco and yellow tobacco, Danville, Va., being the greatest market in the world for the latter. This is used for plug, wrappers, high-grade pipe-tobacco and granulated tobacco in cigarets. American perique is grown only in Louisiana. Tobacco demands a strong and heavily manured soil. The soil's color influences that of tobacco, and its elements the quality of the cured product. Tobacco is cultivated much like cabbage. It is cured, that is, has the sap dried out, by airing it or by heating it. It then is prepared for market by sorting it into grades, which number from two to ten according to the variety of the plant; packed and pressed in boxes; and then fermented or sweated in the warehouse. In 1907 the product of the United States was 698,126,000 pounds from 820,800 acres, and on the farm it was valued at $68,232,647. Russia in 1902 produced 232,767,000 pounds; Hungary 134,567,000 (in 1903); Japan 105,853,000 (in 1904); Turkey 90,000,000; Germany 72,911,000 (in 1903-4); Brazil 55,000,000; France 54,610,000; Java 49,100,000; Sumatra 46,500,000; Cuba 45,740,000; and the Philippines 33,100,000. The total product of the world one year was 2,046,817,000 pounds. The value of American tobacco-products in 1905 was $331,117,681. Cigars and cigarets were 64.7% of this value, chewing and smoking tobacco and snuff 35.3%. The making of cigars and cigarets is one of the few factory-industries pursued in every state and territory. New York leads, followed by Pennsylvania, Florida, Ohio and Illinois. It is grown as a commercial product in almost every state of the Union, Kentucky very far exceeding all other states in acreage under cultivation. The next states in order of production are Ohio, Virginia, North Carolina, Wisconsin and Pennsylvania. Outside of the United States the cultivation of tobacco is chiefly in tropical and semitropical countries, *Vuelta del Abajo*, a rich plain in Cuba, producing the finest grades.

VIRGINIAN TOBACCO

Tobacco-Worms, familiar and very injurious larvæ, the young of sphingid moths. They are large, green caterpillars, striped on the side with white and having horns at one end of the body. A northern species, frequently called the tomato-worm, is found in the country generally wherever tobacco is extensively grown, and is the more common form in the northern tobacco belt. The life-story and habits of the two are very similar. The pupa-state is passed underground. In May and June

the moths appear and deposit their eggs singly on the lower surface of the tobacco-leaves. In three days the larvæ hatch, moult five times, feed voraciously, and in about three weeks reach full growth. There usually are three broods a season, though sometimes there are four in the south and but two in the north. The first brood does not do much damage: it is the July brood the planter fears. In fighting it hand-picking has long been in use, but is expensive. Though objections are made to the use of poison, spraying with Paris green is employed, beginning as soon as the new brood appears. Combatting the pest by destroying adult moths is resorted to; the flowers of the jimson weed, previously powdered by a cobalt solution sweetened with molasses, are placed around a field in the evening; the moths come to these, attracted by the smell of the molasses, and are poisoned. The worm has natural enemies, as insect parasites whose larvæ feed upon it before it transforms to the pupa. Worms covered with what appears to be a mass of small white eggs are often seen; the seeming eggs being cocoons of the parasites. These parasitized worms should not be destroyed, but as natural enemies of the pest given all encouragement.

To'cantîns' River, Brazil, 1,000 miles long, from the junction of the Almas and Maranhão to the Para, into which it falls. Its branches are the Araguaya, Paraman, Great Somno, Tucahunas and Theresa. The Tocantins is eight miles wide at its mouth, and the tide ascends the river for 300 miles.

Tocqueville (*tŏk'vĭl*), **Alexis Charles Henri Clérel' de,** was born at Paris, France, July 29, 1805. He studied law and became a judge at Versailles in 1826. Five years later the French government sent him to the United States to examine the penitentiary system. This mission gave him the chance to study American institutions, and resulted in his writing his masterpiece, *Democracy in America,* one of the very ablest of the many books on America by foreigners. It still is of the highest authority. His other chief work was *The Ancient Régime and the Revolution.* De Tocqueville was in politics from 1839, when he was chosen deputy, till his release from a short imprisonment at the time of Napoleon III's seizure of power in 1851. For five months in 1849 he was minister of foreign affairs. He died at Cannes, April 16, 1859.

Todleben (*tôt'lă-bĕn*), **Franz Eduard,** General, was born at Mitau in Courland, Russia, May 20, 1818. He attended the school of engineers at St. Petersburg. From 1848 to 1851 he was with the Russian army in the Caucasus, fighting the native leader Shamyl. In the Crimean War he became known throughout the world for his defense of Sebastopol. After strengthening the fortifications of Cronstadt and Nikolaiev, he was made chief of engineering in the war-office in 1860. He took a prominent part in the Russo-Turkish War of 1877–8. Todleben wrote a history of the defense of Sebastopol, which has been translated into English and other languages. He died near Frankfort, July 1, 1884. See SEBASTOPOL and SHAMYL.

Togo, Admiral. Heihachiro Togo was born in Satsuma, Japan, 1847. His mother was an educated woman of character and ability; his father was governor of a local province. Little is known of his early boyhood. His first teacher was Takemore Saigo who headed the Satsuma rebellion, and killed himself upon its failure. The spirit of his teaching is expressed in "Where you see faults take the blame of them yourself; where there is merit attribute it to others. Act resolutely, and the very gods and demons shall flee before you." The government sent Togo to England in 1871, where he spent a year as a cadet on the training-ship *Worcester.* Captain Smith described him as "a great plodder; very slow to learn, but very sure when he had learnt." He was made sublieutenant in the Japanese navy but remained at his studies in England until 1878. He rose steadily, and early in his career became known as one of Japan's most daring naval officers. He fully appreciated his country's rights upon the sea and was always ready to defend them. In 1895 he practically began the war with China by firing upon Chinese transports carrying troops with an evidently hostile purpose. The Japanese emperor, at the close of this war, conferred upon him the decoration of the Rising Sun and shortly after made him commander in chief of the standing squadron. On the outbreak of the Russo-Japanese War, 1904, he was appointed commander-in-chief of the Japanese navy, and very ably conducted the operations against Port Arthur. His official report of this action won the admiration of foreign naval officers for its simplicity, directness and modesty. The admiral's greatest victory was in the Battle of the Sea of Japan. He had personally supervised the training of the sailors whose superior marksmanship, at long range on rough water, wrought such terrible destruc-

ADMIRAL TOGO

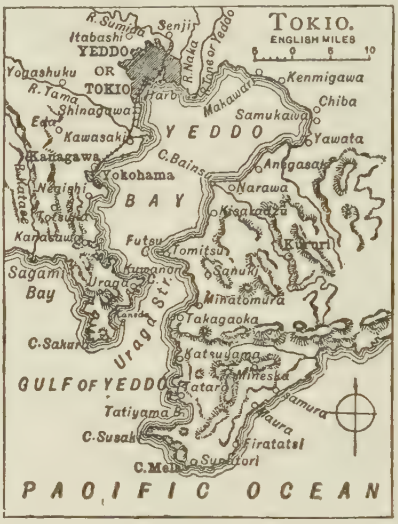
tion in the enemy's fleet. On May 27, 1905, Togo found his position across the path of the Russian fleet, east of the Tsu Islands in the Eastern Channels, and signaled: "The destiny of our empire depends on this action. You are all expected to do your utmost." The entire Russian fleet was sunk, excepting three destroyers and one cruiser. Togo bears his honors modestly. He lives with his wife and children in an unpretentious house in Tokio, devoting his leisure to hunting, fishing and flower-culture.

Togoland (*tō'gō-land'*) is a German possession between the Gold Coast on the west and Dahomé on the east, with an estimated area of 33,630 square miles and a population of 917,227 Sudanese, Negroes and 232 Germans. There are only 32 miles of coast, but the territory widens inland between Volta and Mona Rivers to four times that breadth. The colony extends 335 miles inland. Lome is the chief port and seat of the imperial governor, and Little Popo, Porto Seguro and Bagida are other seaports. The colony is self-supporting. Commerce is increasing rapidly. The imports are chiefly cotton, spirits, tobacco, wood and iron; the exports palm-nuts and oil and rubber. There are two government-schools with 200 pupils and 141 mission-schools with 5,200 scholars. The natural resources are considerable, and the Germans are pushing development vigorously. Germany acquired Togoland in 1884. Good roads connect many of the principal points, many more are under construction, and a railway is building between Lome and Little Popo. The chief postoffices, at Lome, Little Popo and Agome Palime, are connected by telegraph and telephone with one another and with the Gold Coast and Dahomé. There is a railway between Lome and Little Popo.

Tokat (*tŏ-kät'*), a city of Asiatic Turkey, 60 miles south of the Black Sea. It is shut in by mountains on three sides, and suffers furnace-heat in summer. There are large gardens and vineyards, copper is smelted, and cotton is manufactured. There is only a small trade, though Tokat once was an important business center. Population about 30,000.

Tokay (*tŏ-kā'*), a wine made from vines growing in the neighborhood of the town of Tokay, Hungary. The Tokay wine-district covers about 15,000 acres. Great care is taken in assorting the grapes and in preparing the wine, which is brownish yellow while new, changing to a greenish hue as it ages. The yearly yield is about 1,550,000 gallons. The wine-gathering is celebrated by a national festival. Population of the town about 5,100.

Tokio or **Tokyo** (*tō'kē-ō*), meaning Eastern Capital, formerly called Yeddo, is the capital of Japan, and stands in the eastern part of Honshiu, the main island, at the head of Yeddo Bay. The city covers nearly 60 square miles, and is divided into thickly built and inhabited districts, separated by large gardens and groves and cut by canals and moats. In the center is the fortress guarded by stone-walls and a moat, be-



yond which another wall shuts in about three square miles, while a third wall incloses about five square miles. Wide, clean streets lighted by gas; brick and stone buildings; and western merchandise in the stores give Tokio the look of a European city. Shinto shrines and Buddhist temples stand in the cemeteries, and there are four Christian churches. The Imperial University of Tokio, supported by the government, has 260 teachers, exclusive of 16 foreigners, and 4,425 students. There are banks, newspapers, steam-factories, carriages, theaters, telegraph connection with other cities and railroads to Yokohama and Saikyo. Iyeyasu, the famous general and statesman, fixed his seat of government at Yeddo, the "port," in 1600, and here his descendants reigned until 1868, when, as a result of the revolution against the *shogun*, the mikado established his court here and changed the name of the city to Tokio. The city has suffered greatly by fires, and by earthquake shocks in 1656 and 1854. Yeddo was thrown open to settlement by foreigners as the result of the treaty made by Commodore Perry between the United States and the *shogun* in 1854. Population 1,818,655. See JAPAN.

Tole'do, a famous Spanish city, formerly the capital of the country, stands on the Tagus, which surrounds it on three sides, 55 miles southwest of Madrid. It is built on hills 2,400 feet above the sea. The Tagus is its fortress, rushing around it between high and rocky banks and leaving

only one approach on the land-side, which is defended by an inner wall built by Wamba, the Gothic king, in the 7th century and by an outer wall built by Alfonso VI in 1109, both remarkable for the number and beauty of their towers and gates. In the middle of the city rises the high cathedral, surrounded by many churches and convents. This superb cathedral, built in 1492 on the site of a Moorish mosque, though plundered in 1521 and 1808, is remarkable still for its stained glass, sculptured choir and gilded metal pulpits. The famous Toledo blades known in the time of Livy, who wrote about them, were so perfectly tempered that they were sometimes curled up like watch springs and packed in boxes. The Moors captured Toledo in 714; it became a part of Castile in 1085. In the heyday of its career it is said to have sheltered 200,000 people. Toledo also is a province, with an area of 5,919 square miles and a population of 376,814. Population of city 23,317.

Toledo, O., was organized in 1833 by the union of the villages of Port Lawrence and Manhattan. It is on both sides of Maumee River, near its mouth, and covers nearly 30 square miles. There are points in and about Toledo of historic interest. Anthony Wayne, Wm. H. Harrison, Commodore Perry, General Proctor and the Indian chiefs Pontiac, Little Turtle and Tecumseh made Toledo and the Maumee valley of interest to students of history. In 1900 there were only 25 cities in the United States with a larger population. Toledo ranks third in population in Ohio, and is destined to become a great commercial center. It is at the southwestern extremity of Lake Erie, and is, therefore, the natural lake-port for the trade and commerce of the Ohio and Mississippi region, including the greatest corn-growing belt in the world, the oil and coal fields of Ohio and Indiana, the salt, lumber and iron of Michigan. The Ford Plate-Glass works, the Libby Glass factory, the National Malleable Castings Company, the oil-refineries, the automobile factory of the American Bicycle Company and the Craig Ship-yards are some of Toledo's leading industries. There are to-day about 40 million dollars invested in the city's manufactures, which have an annual yield of about $45,000,000.

Toledo is a city of beautiful homes. It has a fine system of parks and boulevards; its street-car system, 26 railroads and steamboat and electric lines give rapid transit to all parts of the country. Its modern school-system is among the best in the United States. It was organized in 1898 upon the federal plan of government. The city supports a fine public library, Toledo University, two high schools, a city normal school, manual-training schools for high school and elementary departments, 40 primary and grammar schools; enrolls 22,000 pupils; and employs about 500 teachers. Population estimated at 184,740.

Tolstoi (*tŏl'stoi*), Count **Leo** (or **Lyof**) **Nikolaivitch,** an eminent Russian novelist and social reformer, was born at Yasnaia Poliana in the government of Tula on Aug. 28, 1828, and was educated at the University of Kasan (Russia in Europe). Early in life he was a soldier, and served in the army in the Caucasus and in the Crimea, where he was present at the battle of the Tchernaya and at the storming of Sebastopol by the allied forces. This experience enabled him to write with such graphic force not only his narrative on *Sebastopol,* but his tale of Napoleon's invasion of Russia, entitled *War and Peace. Anna Karénina,* a tale of guilty passion, placed him among the masters of fiction. This was followed by a number of works which have earned for him the title of the Prophet of Renunciation, and led him to lead the life of an anchorite, toiling on his land with his own hands, sharing his crust with the humblest, in rigid obedience to Christian precept. He is an uncompromising opponent of coercive government and a bitter arraigner of modern society. His other writings embrace *My Religion, Resurrection,* the *Kreutzer Sonata, Master and Man, My Life, My Confession, Patriotism and Christianity, The Christian Teaching, The Kingdom of God Within, The Four Gospels Harmonized and Translated, What is Religion* and *The End of the Age.* See Ward's *The Gospel of Count Tolstoi* in *Prophets of the Nineteenth Century.*

COUNT LEO TOLSTOI

Tol'tecs. See Mexico.

Toma'to, a favorite vegetable or fruit (popularly called love-apple) which ranks perhaps next to the potato in the extent of its consumption. It is a native of the warmer regions of the American continent and is raised largely as a canned vegetable for table-use. It is grown best in a sandy, well-fertilized soil; and may be grown from seed or from cuttings. If from seed, the tomato should be raised under glass and later transplanted to field or garden, care being taken to guard the plant from frosts. The plants while maturing should be supported on stakes or wire-trellis to keep the fruit from the ground and remove danger from rotting.

Tomato-Worm. See Tobacco-Worm.

Tombig'bee, a river of Mississippi and Alabama, which rises in the northeastern corner of Mississippi, receives the Black Warrior and, by its junction with the Alabama, forms Mobile River about 45 miles above Mobile. It is about 450 miles long, and is navigable for large steamboats to Columbus, Miss., 366 miles from Mobile Bay.

Tomp'kins, Daniel D., an American politician who became vice-president of the United States in 1816 and in 1820, was born in what now is Scarsdale, in Westchester County, N. Y., on June 21, 1774. He studied at Columbia College, and, after graduating, was in 1797 admitted to the bar. In 1805–7 he was a justice of the supreme court of the state. after which he became governor for about ten years (1806–17). In 1812 he somewhat arbitrarily prorogued the legislature to prevent the charter of the Bank of America, with a capital of $6,000,000, alleging bribery. He took an active part in the War of 1812, recruiting and equipping well-nigh 40,000 of the state's militia and aiding the state with money raised by his own security. As governor one of his last acts was to recommend the abolition of slavery in the state. He died on Staten Island, N. Y., on June 11, 1825.

Ton'awan'da, N. Y., a city in Erie County, on Niagara River and Erie Canal and on the N. Y. Cent. and Hudson River, Erie and Lehigh railroads, ten miles north of Buffalo. Adjoining North Tonawanda, with which it is connected by a bridge over Tonawanda Creek, it also has connection with Buffalo by two electric tramways. It has a fine park, an armory, public library and high school. Its industries, which utilize Niagara River for water-power, include lumber-manufacturing, a paper-mill, iron-works and ship-yards. Settled about 1820, the town became a city in 1904. Population 8,000.

Tongue (*tŭng*), a muscular organ, reaching from the hyoid or tongue bone, backward and downward and in front to the teeth. The upper surface, borders and front third of the lower surface are free; while the remaining parts are fixed to neighboring parts by the covering of mucous membrane. At certain points this membrane, on leaving the tongue, forms folds containing fibers, which act as ligaments to the tongue. The largest of these folds is called the *frenum* or bridle of the tongue, and joins its free front end to the lower jaw. This bridle limits the backward movement of the tip of the tongue. In rare cases it reaches to the tip, so as to interfere with speech and chewing, and the child is said to be tongue-tied. The upper surface is divided into two parts by a middle, lengthwise furrow. (For the little hills on the top of the tongue see TASTE). At the back of the surface are mucous glands, reaching into long canals and helping to secrete the fluid that moistens the tongue. The furrow on the under surface is deeper, with veins running forward on each side of it. The base of the tongue becomes wider before being fixed in the tongue-bone, which, with the ligaments, is the tongue's framework. There are two sets of muscles, the extrinsic or outside muscles, which fasten the tongue to certain points and move it on them; and intrinsic or inside muscles, which pass from one part of the tongue to another, make up its chief bulk and move it on itself. By the action of the various muscles the whole tongue may be drawn back; its upper surface be hollowed or bowed or pressed against the roof of the mouth; its tip may be thrust straight out or sideways, upward and downward or into a hollow tooth where food might lodge. See TASTE.

Ton'ka Bean. See VANILLA.

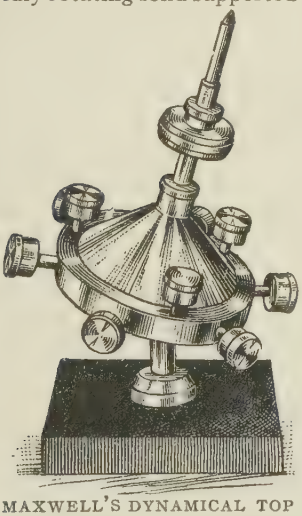
Ton'quin or **Ton'kin,** a dependency or protectorate of France in French Indo-China, acquired in 1884. Its area is 46,000 square miles, with an estimated population of close upon 10,000,000. It is south of China proper with Burma on the west, Siam and Anam on the south and the Gulf of Tonquin on the east, enclosed from the south China Sea by the island of Hainan. It is traversed by Song-Koi or Red River, on which is Hanoi, the capital and largest city, the seat of the resident superior of the protectorate and of the governor-general of French Indo-China. Its chief port, on the Gulf of Tonquin, is Haip-hong, which has a fine harbor and is connected by a railway, 60 miles in length, with the capital; while another line runs inland for 200 miles to Vinh. The forests of the dependency are rich in ebony, sandal-wood and iron-wood; while the vast lands of the delta yield rice, sugar-cane, mulberry, bamboo and areca-nut; the mountainous parts produce coffee, tobacco and indigo. Jute has recently been cultivated considerably; while other exports include oils, pepper, animal-products, silk and rice. Among its useful animals is the buffalo. Before the French protectorate was established, the region formed a part of the Anamese kingdom, now also embraced in French Indo-China. On the coast, which is a vast marshy stretch, are coal-beds estimated to be from 300 to 400 square miles in extent. Formerly the country was infested by predatory Chinese soldiery, known as "Black Flags" and supposed to be escaped bands of the Taiping rebels. See ANAM, CAMBODIA, COCHIN-CHINA, LAOS, SHAN and SIAM.

Toombs, Robert, American politician, member of the Confederate Congress (1861) and Confederate secretary of state, was born in Wilkes County, Ga., July 2, 1810, and died at Washington, Ga., Dec. 15, 1885. After graduating at Union College and studying law at the University of Virginia, he was elected to Congress in 1844, and in

1850 contributed to the passing of the compromise measures. From 1853 to 1861 he was a member of the United States senate, a southern extremist and leading disunionist. In 1861 he became secretary of state in the Confederate government, but resigned to accept the commission of brigadier-general on the southern side. He was at the second battle of Bull Run, was at Antietam in 1862 and in 1864 commanded the militia of Georgia. After the war he lived abroad till 1867, denouncing strongly the reconstruction measures of Congress, and on his return to the south he refused to take the oath of allegiance to the United States government. Consult Trent: *Southern Statesmen of the Old Régime.*

Ton'ty, Henri de, an Italian explorer of great resolution and courage and a companion of La Salle, was born about the middle of the 17th century and died at Fort Louis (Mobile) in 1704. He served both in the French army and the navy, was with La Salle in Canada, effected the first settlement in what now is Illinois, and accompanied La Salle on his famous voyage down the Mississippi to its mouth. He returned for supplies; and in 1686 again descended the Mississippi in search of La Salle. He is identified with the early history of Illinois (until 1702) and of Louisiana. His memoirs were published in Paris in 1897. Consult Parkman's *Discovery of the Great West.*

Top. The ordinary spinning-top is a rapidly rotating solid supported on a single point below the center of gravity. Suspended in this way the weight of the top acting through its center of gravity exerts a moment of force which tends to tilt the top. The result is that the top "precesses," instead of falling over, thus exhibiting those phenomena so well-known to every boy of ten. For a detailed explanation of the dynamics of the top consult Worthington's *Dynamics of Rotation,* chap. xiii, or Perry's *Spinning-Tops.* Clerk-Maxwell devised a top having more or less the shape of a bell, so that the point of support could be placed at, above or below the center of gravity. It is provided also with adjusting screws as shown in the accompanying figure, so that its mass can be distributed in various ways about the axis of rotation. The chief interest attracting this particular form of top, besides the fact that it most beautifully illustrates the general principles of rotation, lies in the fact that it accurately simulates the motion of our earth on its axis, demonstrating on a small scale the phenomena of precession, nutation, variation of latitude dynamic and static instability etc. Consult Maxwell's original account in his *Scientific Papers,* Vol. I., pp. 248-68, and a detailed and popular account in *The Physical Review,* Vol. VI., March, 1898. See Gyroscope.



MAXWELL'S DYNAMICAL TOP

To'paz, a mineral and a gem, the finer varieties of which are much valued for their luster and the beauty of their colors. It is made up chiefly of alumina, silica and fluorine. It is usually found in very old rocks and in most parts of the world. Fine topazes are found in Ceylon, but those most prized come from Brazil. Topaz either is colorless or in many shades of red, blue, green or yellow; it is translucent or almost transparent on the edges; and it is harder than quartz. When cut or set, topazes are easily mistaken for diamonds or rubies, but they are not so hard as either of these gems.

Tope'ka, Kas., capital of the state and county-seat of Shawnee County, is built on both sides of Kansas River, 67 miles west from Kansas City and 300 from St. Louis. The surrounding country is a rich, rolling prairie. It is a large milling-center, and has manufactures with a yearly output of $10,000,000. It also is an important railroad and distributing point, being served by the Santa Fé, Rock Island and Union Pacific main lines and a branch of the Missouri Pacific. It has electric street-railroads, broad streets and handsome churches and buildings. Among the public buildings are the capitol, United States government building and the state asylum for the insane. Besides these Topeka has two handsome buildings belonging to the Y. M. C. A., and the railroad Y. M. C. A., a splendid auditorium and 71 churches. The free public library has 10,000 volumes, the Kansas Historical Society library 40,000 volumes, and the state library 28,000 volumes. The public-school system is excellent and includes high and manual-training schools, while among its schools of higher learning are Washburn College (Cong.), founded in 1865, having 720 students; an Episcopal college for women; and a Roman Catholic seminary. Topeka was settled in 1854, and became the capital in 1861. The city owns the electric street-lighting plant and its water-works, while the Topeka Edison Company furnishes light, power and heat for commercial and domestic uses. Topeka is also supplied with natural gas, which is distributed for domestic and manufacturing uses. Population 37,640.

Top'lady, Augustus Montague, was born at Farnham, Surrey, England, Nov. 4, 1740. He went to Westminster School and Trinity College, Dublin, became a clergyman, and preached in Devonshire and in London. For a time he was editor of a religious magazine, and he published religious books. He is remembered as a hymn-writer, especially as the author of *Rock of Ages*. Toplady died at London, Aug. 11, 1778.

Torna'do. See STORM.

Toron'to, Can., capital of Ontario is on the northern shore of Lake Ontario. The harbor at its front is formed by an island lying south of it. We first hear of it as a trading-fort built by the French in 1749 and named Fort Rouille. Later it was known as York. It was incorporated as a city in 1834 with the name of Toronto. It is the legal, educational and legislative center of the province. Osgoode Hall with its court-rooms and law-library, named after Chief Justice Osgoode and centrally located in spacious grounds, is a center of attraction for visitors. The parliament-buildings, stately and handsome brown-stone structures in the park, and the group of buildings near by, devoted to the growing work of the University of Toronto, deservedly are objects of local pride. The main building of the university is, architecturally, one of the most imposing on the continent. Near these are Wycliffe, McMaster, Victoria and St. Michael's Colleges and, at no great distance, Knox and Trinity Colleges. The educational institutions attract 10,000 students. Only a few universities in the world have a larger roll-call than Toronto University. The city rises gradually from the lake northwards, and a number of streets in its northern portion, the residential part, are noticeably beautiful. Industrially Toronto is making great progress. The value of the annual output is near $100,000,000. One department-store alone (T. Eaton Company) employs 4,000 hands. In 1906 electric power was brought to the city from Niagara Falls, and cheap power unlimited in quantity so easily obtained will attract capital and further build up industries. The city is well-provided with hospitals, libraries, churches and parks. Its electric railway has nearly 100 miles of track, and each year carries nearly as many millions of passengers. The leading railways, the Canadian Pacific, Grand Trunk and Canadian Northern, contribute to its growth. Steamers, passengers and freight cross to Niagara (Lake Erie) and to Kingston and points east, including Montreal and Quebec, across Lake Ontario. Americans in great numbers visit Toronto each summer. The island, stretching along the front of the city, dotted with summer residences and hotels and overlooking the great lake, is attractive to citizens and visitors alike. Its ready accessibility (within a few minutes of the heart of the city) makes it a most valuable asset. Population about 300,000. See CANADA and ONTARIO.

Torpe'do, the popular name for electrical fishes closely related to the skates and rays. They are capable of giving electrical shocks, and are also called cramp-fishes. There are 15 or 20 species inhabiting mainly the warmer seas, but one species is found on the Atlantic coast from Cape Cod south. It has a broad, disk-shaped body with a stout tail and reaches a length of three to five feet. It is black above and whitish below. The electrical organs in all these fishes consist of two clusters of six-sided prisms, one on each side between the head and the broadly expanded pectoral fin. There are about 500 prisms in a single organ. The latter is richly provided with nerve-fibers, and the discharge is under the control of the fish.

Torpedo, an apparatus or machine designed to destroy ships by blowing them up with an explosive. Torpedoes are either stationary, floating or moving. Stationary and floating torpedoes are used in defensive operations, as in harbors or rivers. They are placed in the harbor, either being anchored or allowed to drift within certain limits, and so arranged that they explode by contact with a ship or can be exploded by an electrical contact from some convenient point. Moving torpedoes are projected through the water, either on or below the surface, and explode upon coming in contact with a ship. They may depend for motion wholly upon the original force of projection, or they may be supplied with some motive power by which they move themselves. When they are projected, they are usually discharged by compressed air from a long tube called a torpedo-tube. Many war-ships are fitted with these torpedo tubes, but special boats called torpedo-boats are more often used for the purpose. A torpedo-boat is a small, fast steamer fitted with appliances for launching torpedoes. Some navies have somewhat larger steamers which have great speed, and are equipped with fast-firing guns for protecting the large cruisers and battleships from torpedo-boats. Such boats are called torpedo-destroyers. Torpedo-destroyers are also supplied with torpedoes and torpedo-tubes for offensive operations. The use of torpedoes in warfare dates back to the 16th century, when floating torpedoes were used to blow up bridges etc. During the American Revolution floating torpedoes were tried with little success against Lord Howe's ships, both in New York harbor and on the Delaware. Col. Samuel Colt of Hartford, Conn., made numbers of experiments for the United States government about 1840. These experiments were in many ways successful, but did not lead to the general use of torpedoes. During the American Civil

War the Confederates made large use of torpedoes as a means of defending their ports, and 24 Federal war-vessels and transports were destroyed by torpedoes. Torpedoes were used successfully by the Germans in 1870-71 in keeping off the French warships and by the Russians in the Russo-Turkish War (1877-8) in keeping Turkish ships out of the Danube. The torpedo employed until 1885 was a spar torpedo, but has been superseded by the automobile torpedo. The Whitehead, Schwartzkopf and Howell torpedoes are the only successful torpedoes of this sort. The Whitehead goes more than half a mile at 30 knots an hour, strikes within a few yards of the spot aimed at on a ship and is a miracle of ingenious mechanism. It costs over $3,000. During the Spanish-American War the Cuban harbors were mined, and so kept out the United States warships, but no ships were destroyed by torpedoes on either side. Within recent years much study has been given to submarine boats for torpedo warfare. The Holland submarine has been successfully experimented on by the United States. It dives like a duck, goes ten miles an hour on the surface, carries torpedo-tubes and fires the largest Whiteheads. The American navy (1908) has eight submarines, 16 torpedo-boat destroyers and 36 torpedo-boats. In the Russo-Japanese War 16 torpedo-boats sank a battle-ship and five cruisers, only two of the torpedo-boats themselves and ten of their crew being lost. England, France and Germany also, have many destroyers in their navies. We, however, fall short in submarines as well as in destroyers. The French also have numbers of successful submarine boats for torpedo warfare. The study of this science is carried on with great secrecy by the different nations. The American naval school for this work is at Willet's Point in New York harbor. See NAVY.

Torpedo-Boat. See TORPEDO.

Torquemada (*tôr kā-mä'thä*), **Tomás de,** a Spanish monk, was born at Torquemada, Spain, about 1420. He was a Dominican friar, and was made inquisitor-general for Spain in 1483 He is famous as the organizer of the Inquisition, with its tribunals at Seville, Cordova and Toledo. He was too zealous even for the perscuting spirit of the age, and Pope Alexander VI appointed four colleagues to hold him in check. He obtained the expulsion from Spain of the Jews and Moors. He died at Avila, Sept. 16, 1498.

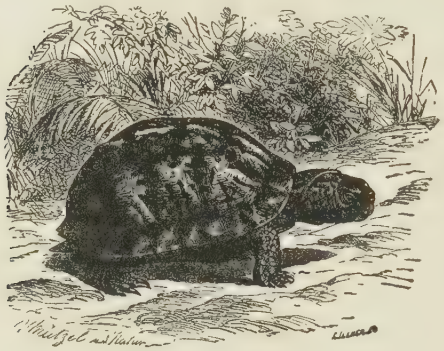
Tor'rey, John, an American botanist, was born at New York, Aug. 15, 1796. While studying medicine in New York, he founded the Lyceum of Natural History. He was professor of natural sciences at West Point for three years, of chemistry at Princeton, and also had the same chair in the medical college at New York. His reputation as a chemist brought him the position of United States assayer, which he held for nearly 20 years. The results of his work on the state geological survey of New York and on several United States exploring expeditions are found in *Catalogue of Plants Growing within Thirty Miles of New York City, Flora of New York, Flora of the Northern and Middle States* etc. His fine botanical library and the collections of 40 years he gave to Columbia College, New York City. He died on March 10, 1873.

Torricelli (*tŏr'rē-chĕl'lē*), **Evangelista,** an Italian physicist, especially remembered as the inventor of the mercurial barometer. He was born at Faenza, Oct. 15, 1608, and died at Florence, Oct. 25, 1647. His work was largely inspired by the writings of Galileo, whose pupil and private secretary he was during the last three months of Galileo's life. Torricelli substituted mercury for water in the barometer and found that it rose only 30 inches instead of 33 feet in a closed tube. This led him to the conclusion that in each case the cause of the ascent is the pressure of the earth's atmosphere. This conclusion was shortly afterward clinched by Pascal, who carried a barometer to a mountain-top and found that the mercury fell as he ascended. Besides two important theorems in the mechanics of solids, Torricelli enunciated the theorem that a liquid flows from an orifice with the same speed that it would have acquired in falling freely from the surface of the liquid to the level of the orifice. See BAROMETER.

Tor'rington, Conn., a town and borough in Litchfield County, on Naugatuck River and on the New York, New Haven and Hartford Railroad, 17 miles north of Waterbury and 25 west of Hartford. Settled in 1737, three years later it became a town, and in 1887 was incorporated as a borough. It is actively and largely interested in manufactures, aided by the facilities of good waterpower. Among its products are woolen goods, machinery, iron and brass castings, plated goods of copper, nickel, silver and gold, furniture, bicycles, needles and machine-tools. Its public buildings include a library, high and elementary schools, municipal buildings and churches. It also has the fine park called Coe Memorial Park. Population about 12,000.

Tortoise (*tôr'tĭs*), a name loosely applied to any turtle, but more correctly restricted to particular members of the turtle family. The true tortoises are land-turtles, represented in the United States by the wood-tortoise, the box-tortoise and the burrowing turtles of the southern states. They feed upon plants and fungi. Their shell usually is highly arched, with the hard plates showing concentric markings. Their nearest relatives are fresh-water species like

the painted and speckled turtles, which sometimes are incorrectly called tortoises. The so-called tortoise-shell comes from a



BOX-TORTOISE

salt-water turtle, called the hawksbill. See TERRAPIN and TURTLE.

Tortug'as. See DRY TORTUGAS.

Tor'ture, a means of extorting confession of guilt by inflicting severe pain. It was used at first on slaves, and with the Romans on those who were not Roman citizens. Paul protested against the use of it, saying: "Is it lawful to scourge a man that is a Roman uncondemned?" Under the emperors the use of it became general, extended through Europe, and reached its severest form in the tribunals of the Inquisition. The scourge; the rack, which stretched the whole body, sometimes until the joints were dislocated; the boot, rings of iron around the legs with wedges driven in until the flesh was mashed to a jelly; and the thumb-screw were among the many hideous instruments used. Judicial torture in England was inflicted only by order of the sovereign, and the last use of it was in 1640. France abolished it in 1786; Russia in 1801; and Austria, Prussia and Saxony about the middle of the 18th century.

To'rus (in plants), the same as "receptacle." See FLOWER.

Toscanelli del Pozzo, surnamed Paul the Physician, was born in Florence, Italy, 1397, and died there in 1482. He distinguished himself as an astronomer and physician. For a number of years he had charge of the celebrated library founded at Florence by Nicolo Nicoli. He read the accounts of the travels of Marco Polo and met many travellers from foreign lands. These experiences, with his knowledge of astronomy, convinced him that a western route to the Indies was possible. He corresponded with the king of Portugal and with Columbus on the subject, and prepared maps to show the proper course for such a voyage. These papers were in possession of Columbus in 1492.

To'tal Ab'stinence or Tem'perance. The abuse of intoxicating liquors early led to the formation of temperance societies to influence public opinion on the subject and help those who were endeavoring to overcome the appetite for strong drink. The first temperance society in the United States was formed at Litchfield, Conn., in 1789 by 200 farmers who pledged themselves not to use liquors in carrying on their farmwork. Early in the 19th century the temperance movement because organized, and the churches, especially the Methodist and Presbyterian, were active in the work. The Massachusetts Temperance Society was formed in 1813, and the American Temperance Union in 1826. The early societies were temperance societies strictly, not total abstinence organizations. They did not oppose the use of wine, cider or malt liquors, a brewery being built in Boston by the temperance reformers. The first national temperance convention met in Philadelphia in 1833, and formed a national temperance union, with 23 state societies and over 7,000 other societies. "Total abstinence from all that intoxicates" was first insisted on in 1833 by the Massachusetts Society.

The Washingtonian Temperance Society was formed by six reformed drunkards at Baltimore in 1840, and was very successful in its special work of reforming hard drinkers. The Sons of Temperance was another society which in 1850 numbered about 240,000 members. The Good Templars, another temperance order, founded in 1852, is a secret society with passwords, grips etc., with a membership of about 750,000. A remarkable movement in the temperance cause is what is known as the crusade, which began in Hillsboro and Washington Court House, O., in 1873. It was a crusade of women against saloons, and the weapons used were prayer, persuasion and persistence. The movement spread rapidly and was the means of closing many saloons, in some places all that were in operation. The Woman's Christian Temperance Union is the successor to this temperance crusade. It has organizations in every state and territory of the United States, in Great Britain, Canada, Australia, New Zealand, India, Japan, Madagascar, South Africa and the Hawaiian Islands. It has 500,000 members in 50 nations. Its work includes 35 departments. It has been active in distributing temperance literature, in securing the study of temperance science in the public schools, in the establishment of homes for girls and in securing laws forbidding the sale of tobacco to children. It is agitating for an eight-hour day, peace through arbitration, industrial education and social purity. Its efforts for constitutional prohibition and for total abstinence by individuals are best known. The badge is a

bow of white ribbon. The headquarters are at Chicago, where the society has built the Woman's Temperance Temple, one of the finest buildings in Chicago. Its work is supplemented by that of the Catholic Total Abstinence Union, having 100,000 members.

The first laws against the use of liquor were made in Massachusetts in 1639 and about the same time in Connecticut. Oglethorpe in 1733 had the importation of rum into Georgia prohibited as well as of slaves. In 1756 a duty was imposed on imported liquors in Pennsylvania, and in 1774 the first Continental Congress proposed to the different states the passage of laws to stop the distilling of liquors. The ration of grog in the army was changed to coffee in 1832. License laws were passed in some states, but met with strong opposition. After the supreme court had in 1847 decided in favor of prohibitory laws, Maine was the first state to use the power. Delaware, Rhode Island, Vermont, New Hampshire, Massachusetts, Michigan, Iowa, Indiana and Kansas all passed laws prohibiting the sale of liquors, but the law was repealed later in most of the states and license laws substituted. The Prohibition party grew up from the effort to induce state and national legislation favorable to prohibition.

In recent years the liquor problem has been severely scrutinized all over the world. The open bar is more and more regarded as a nuisance, an injury and a peril to society and the state. Consequently public opinion against the saloon has made itself felt in almost all Europe as well as in America, Australia and New Zealand. Both Great Britain and the United States are increasingly limiting the number of places at which intoxicating liquors are retailed and reducing the area of the influence of drink. In 1904 English local magistrates were given power to refuse to renew licenses for saloons that they consider needless, compensation being given to the ousted liquor-dealer, and in 1908 it was enacted that after 1922 compensation shall *not* be paid and that magistrates shall be free to close as many houses as they see fit. After April 5, 1909, the people in any locality are to have the power to prohibit the granting of any *new* license. In the United States, however, greater progress has been made in regulating the liquor-traffic than in any other country. The efficient organization under which the crusade has been carried forward since 1903 is the Anti-Saloon League. The platform of this organization has but one plank — *The Suppression of the Saloon.* It thus has the support not only of those of strict temperance views, but of large numbers who, while not total abstainers, are alive to the evils and the menace of the open saloon. The effort of the Anti-Saloon League has been to secure the enactment of local option laws, under which the voters in village, town, township, city, county or state may determine by a majority vote whether or not intoxicating liquors shall be sold in the political division in which the vote is taken. In nearly all the states there now is some form of local option; and in most of these states the territory under prohibition has steadily increased, while state prohibition exists in Alabama, Georgia, Kansas, Maine, Mississippi, North Carolina and Oklahoma. The same story comes from Belgium, Canada, Finland, France, Germany, New South Wales, New Zealand, Norway, Rumania, Russia, Sweden, Switzerland and Victoria. In these countries, as in others, the state legislates particularly against the liquor-traffic as a special source of danger. The whole trend of modern legislation makes increasingly toward limiting the supply and controlling the distribution of liquor.

To'tem, a carved or painted symbol, in use among the American Indians and the primitive peoples of foreign lands to indicate kinship and the special tribe to which they belong. These symbols are very varied in character, including things inanimate, as trees, plants and the heavenly bodies — the sun, moon or stars; as well as objects of animate life, as birds, beasts and fishes. These, when adopted, become the hereditary tribal mark and the indication of clanship, and are not only found on the tribal totem pole, but are frequently indicated on the person of members of the same tribe by tattooing or burning the rough symbol into the skin. These totems are sacred to the tribe adopting them, and in the case of animal, bird or fish life, they are withheld from eating or destroying them. They thus become a sort of blood-bond, and in some instances they restrain marriage among those who adopt a certain tribal symbol or totem. A considerable literature deals with the subject of totemism in different lands, as well as with kinship and marriage and the tribal customs among early races of mankind.

Toucan (*tōō'kan*), the name for birds with enormous, bright-colored bills, inhabiting South America and ranging as far north as Mexico. The bills are light, as they are filled with air-cavities. These birds feed on bananas, insects and reptiles. They frequent lofty trees. They are sometimes confused with the horn-bills of Africa, birds with greatly enlarged bills but belonging to a different family.

Touch (*tŭch*), that one of the five senses by which contact or pressure is perceived. It also is usually made to include the senses of temperature and pain. It is possessed more or less acutely by all parts of the free surface of the body, walls of the mouth and nasal passages. Its delicacy

depends upon the number of particular touch-organs in a square inch and also on education. The blind, for example, can be taught to read by passing their fingers over raised letters, and physicians and some artisans acquire an educated touch of remarkable acuteness. Touch is most accurate in the tip of the tongue; the palm of the forefinger stands next; and the back is the least sensitive to contact. The whiskers of cats and other similar organs increase the efficiency of this sense. As regards the temperature of sense, it has been shown that there are distinct hot and cold spots lying close together on the surface of the skin.

Toulon (*tōō'lôn'*), a city of France, on the Mediterranean, 30 miles southeast of Marseilles. It is on a double bay, sheltered by mountains, and has the largest military port on the Mediterranean, covering 240 acres, with large buildings, arsenals and floating docks. The cathedral, town-hall, military and naval schools and theater are among its finest buildings. Shipbuilding and the trade connected with the military and naval works are the principal industries of the city. Toulon was used as a harbor by the Romans. The fine fortifications built to protect the city from pirates withstood an attack of the English and Dutch fleets in 1707. The English captured the city in 1793, but were driven out by Napoleon. Population 103,549.

Toulouse (*tōō'lōōz'*), a French city on the Garonne River, 130 miles southeast of Bordeaux. The beautiful church of St. Sernin, the cathedral, a fine museum of art, a public library, an observatory and an arsenal are among its attractions. It has manufactures of woolen and cotton goods, cutlery and hardware. Toulouse was the capital of the Visigoths in the 5th century. From the 8th to the 13th century it was governed by counts or dukes, and was then attached to the French crown. The battle of Toulouse, in which Wellington was victorious over the French under Soult, was fought on April 10, 1814. Population 149,438.

Tourgée (*tōōr-zhā'*) **Albion W.,** an American author, was born at Williamsfield, O., May 2, 1838. He studied at the University of Rochester, N. Y.; enlisted as a private in the 27th New York volunteers; was wounded at Bull Run and at Perryville; and was held a prisoner for four months. He moved to North Carolina, where he was prominent in the reconstruction of the state, drawing up the constitution and aiding in the revision of the laws. His writings, besides legal works, include *Toinette*, *Figs and Thistles*, *A Fool's Errand* and *Bricks without Straw*. In 1897 he was appointed consul to Bordeaux, France. He died on May 21, 1905.

Tourmaline (*tōōr'mà-lĭn*), a mineral found in granite, gneiss and sometimes in sandstone. The color varies according to the materials tourmalines are made of. The blue, pink and green ones have little iron, while the black ones probably are colored by iron. Silica, boric acid, alumina, lithia, soda, lime, magnesia etc. enter into their composition. Tourmaline is found in Maine, Massachusetts, New Hampshire and Vermont in red, green and blue crystals, while brown ones are found in New York and very fine black ones in California. In the Ural Mountains, the island of Elba and the St. Gothard fine specimens are found. See *The Tourmaline* by Hamlin.

Tournament (*tōōr'nà-ment*), a military festival or contest. They were usually contests between knights on horseback, and the name came from the skill needed in turning their horses. If only two knights contended, it was called a joust; but several combatants made it a tournament. Invitations to a tournament were given by princes or nobles through heralds, and the attending knights came with large retinues and gay banners, while crowds of gaily dressed spectators filled the seats around the place of contest. The rules of the tournament prescribed the kinds of weapons to be used, the mode of warfare and the rank of those who might enter the lists. The prizes awarded by judges were given by the ladies. The early tournaments were like the gladiatorial shows in Rome, often resulting in the death of the combatants, and were for a time forbidden in England and opposed by the church, but during the crusades they came into favor and flourished as court pageants until Henry II of France received a fatal wound, when they were abolished in Europe. See *Ivanhoe* by Scott.

Tours (*tōōr*), a French city, at the junction of the Loire and Cher Rivers. The finest bridge in France crosses the Loire. There are two towers standing of the famous Church of St. Martin. Tours is known for its silk-manufactures, being the first place to introduce the trade, which was so extensive that it had 80,000 inhabitants when the repeal of the Edict of Nantes drove away its best artisans. The states-general of France met in Tours at different times during the 15th and 16th centuries. It was occupied by the Germans in 1871. Population 67,601.

Toussaint (*tōō'săn'*), **François Dominique,** called also L'Ouverture, the black chieftain of Haiti, was born of slave parents near Cape François, Haiti, in 1743. In 1791 the mulattoes and blacks made a struggle for their rights, and Toussaint, after helping his master to escape with his family to Baltimore, joined the army and soon became a general, capturing the white army without bloodshed. The black leaders at first accepted the help of the Spaniards, but when the English invaded the island,

where French and Spanish and colored troops were all contending, Toussaint declared for France, which had proclaimed freedom for the slaves. He joined the French leader, drove the English and Spanish from the island, and was made commander-in-chief of Santo Domingo. The civil war between the mulattoes and blacks ended in the whole island becoming subject to Toussaint, who governed it under the French. He selected a council of nine members, composed of eight white citizens and one mulatto, which chose him president for life. The constitution adopted was sent to France; but Napoleon, the first consul, said: "He is a revolted slave whom we must punish." A fleet of 30,000 men and 66 war-vessels was sent to Haiti to re-establish slavery, and after ineffectual efforts to conquer the island offers of peace were made, promising with solemn oaths the liberty of the people and that Toussaint should be retained in power. He signed the treaty of peace on these conditions, but was seized treacherously with his family, and sent to France, where he was imprisoned without trial or accusation in a cold, underground dungeon at Besançon. He sent appeals for trials and his defense to Napoleon, but got no answer. At last, worn out with cold and left four days without food or drink, he was found dead in his cell on April 27, 1803. Whittier and Wordsworth have embalmed the name of Toussaint L'Ouverture in their poems. Wendell Phillips made him the theme of an oration.

Tow'er, Charlemagne, an American diplomat, was born at Philadelphia on April 17, 1848. He graduated from Harvard University (1872), spent four years in Europe, and in 1878 was admitted to the bar. He became active in business affairs, including railroad interests and mining, for some years; but in 1891 he began to devote himself exclusively to history and archæology, and became a professor in the University of Pennsylvania. He was appointed United States minister to Austria-Hungary in 1897, ambassador to Russia in 1899, and ambassador to Germany in 1902, retiring in 1908. He has published *The Marquis de La Fayette in the American Revolution* and *A Catalog of a Collection of American Colonial Laws.*

Tower of Lon'don, a famous ancient citadel erected by William the Conqueror about 1078 to dominate the city. It is in the oldest part of the British metropolis, on the north bank of the Thames, about a mile below London Bridge. It is surmounted by a keep, known locally as the White Tower, — the council chamber of the early kings. The Tower is historically notable for the many distinguished persons — traitors and others — who have been confined within its walls as prisoners of state or have met death on the scaffold or at the headsman's block on the adjoining Tower Hill. In modern days it has become the repository of the national arms; and since the restoration the *regalia* or crown-jewels have been kept in the Tower on exhibition.

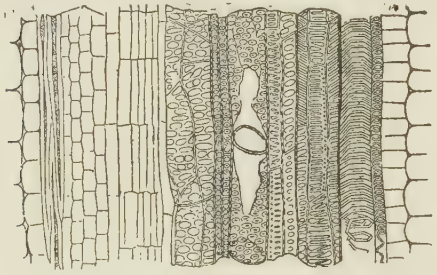
Towhee or **Cheewink,** member of the finch family. The bird is smaller than the robin, the color of its sides a rich, reddish chestnut, below white, upper part black, tail tipped with white. The call-notes give it its names; its song, simple and pleasing, is heard from among the branches. Favorite haunts are thicket and scrubby wood. It forages on the ground, is expert in unearthing wire-worms, beetles and larvæ, and has special liking for hairy caterpillars and potato-bugs. It nests on the ground, the nest seeming a very part of the soil, the eggs white marked with dull brown, in number four or five. The birds migrate in April, September and October, the breeding-range extending from the lower Mississippi valley and Georgia northward to Maine, Ontario and Manitoba. It sometimes is called ground-robin.

TOWHEE

Town-Meet'ings are held annually in the New England towns for general discussion, the election of officials and the voting of taxes. A town in New England does not necessarily mean a small city; but, rather, a unit for the administration of local government, often mainly rural. The township system is much more important in New England than elsewhere. It dates from the days of independent, local governments by the Pilgrim Fathers and the Puritans, when the town was essentially the church, and the church was almost the state. The New England town-church was intensely democratic. Thus the town-meeting as still practiced in New England affords the most perfect example of a completely democratic government. All the legal voters of the town may appear, and discharge the duties of government, as in some of the Swiss cantons, not through their representatives but in person. The colonial legislatures left the townships to govern themselves almost without interference, except where the colonial laws might happen to be transgressed. Town-

meetings were at one time held about once a month; and even now special meetings in addition to the annual meeting are occasionally held. But the usual type of town-meeting is that which meets annually, elects a committee of selectmen and such officials as the town-clerk, the tax-assessors, the treasurer, the school-trustees and the overseers of the poor. The officials so named may themselves constitute the board of selection. The New England town-meetings resemble the Old-English town-moot; but seem not to have been direct imitations of it.

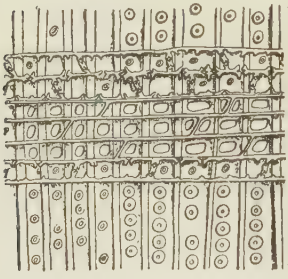
Trachea (*trā'kē-ā*) (in plants), the characteristic element of wood or xylem, the tracheæ together constituting the tracheary tissue. A trachea is a vessel composed of a single, elongated cell or of several cells set end to end. The cells usually are of large caliber, with very heavy walls, which are variously thickened. In some cases the thickening consists of a spiral band, in others of distinct, encircling rings. Frequently the thickening of the walls leaves definite, thin spots, called dots or pits. In this way the spiral, annular and dotted ducts or vessels are formed. The tracheary tissue is chiefly concerned in the conduction of water from the roots to the leaves;



Vertical section of stem from the epidermis (at the left) to the pith (at the right), the vessels or tracheæ being recognized by their large size and by their pits and spirals.

and frequently it is an important or even the chief mechanical support of the body.

Tracheid (*tra'kē-id*) (in plants), a single cell with all the wall features of a trachea, but not uniting with others to form a vessel. It is more or less elongated and taper-pointed like a fiber. Tracheids form the characteristic soft and straight-grained wood of pines and other conifers. In these forms, as in all gymnosperms, the walls of the tracheids contain bordered pits, that is, pits which appear to have a double border about them. This type of pit is a constant feature in gymnosperms, so that the group may be recognized even by a single wood-fiber.



Vertical section of pine wood, showing the pitted tracheids crossed by a pith ray.

Track-Events are sports practiced on a circular path. They comprise running and hurdling. Running includes sprinting for 50, 100 or 440 yards and runs of ½, 1 and 2 miles. Hurdling is sprinting for 120 or 220 yards and leaping 10 hurdles, those of the longer course being 2½ feet in height, those of the shorter course a foot higher. The hurdles of the long course are 20 yards apart, but on the short course the first hurdle stands 15 yards from the start, the next eight are ten yards apart, but the tenth is 15 yards away. Hurdling demands judgment and skill as well as strength and speed.

Trade-Mark, the name or device used to distinguish the merchandise of a firm from that of others. Trade-marks are protected by law in nearly all countries, in order to protect buyers from frauds and enable a merchant or manufacturer to profit by the superiority of his goods. In the United States a merchant or firm registers its trade-mark in the patent-office (*q. v.*), and is entitled to its use for 30 years and to renew it for 30 years more.

Trade-Routes. Many of the trade-routes of the world have been discussed under CARAVANS and OCEAN-ROUTES; and it will here suffice to describe the chief trade-routes leading from America and Great Britain. In ancient times the chief trade-routes were overland; at present they are over sea. From the days of the ancient Phœnician traders to the 15th century the only important sea-routes were the coastal routes of the Mediterranean and Atlantic. But Vasco da Gama's discovery of a way to India around the Cape of Good Hope in 1497 and that of a supposed route to Asia by Columbus in 1492, followed as they were by a host of similar explorations, opened great oceanic highways. The chief of these routes were those to the West Indies and South America, to India around the Cape of Good Hope, to the East Indies *via* India and to the Pacific through the straits discovered by Magellan in 1520. By the discovery of these routes a change was made in the focus of commerce from the Mediterranean cities to those of western Europe. The great trade-routes of the ancients led to and from such cities as Tyre, Sidon, Ephesus, Carthage and Rome, and those of the middle ages were focussed at Venice and Genoa, all being Mediterranean ports.

Spain and Portugal took the lead in the trade of the 15th and 16th centuries; but were soon eclipsed by Holland and England. The greatness of the trade of France, America and Germany is of later develop-

ment, although as early as the beginning of the 18th century France was a formidable rival of England in America and the Indies.

The trade-routes of the United States may be mentioned in connection with the chief cities. Portland (Maine) in New England has a shipping-trade with Canada during the winter, when the St. Lawrence is frozen. From Boston, Mass., vessels trade mainly with Europe; but also to all parts of the world, even to Australia for wool. Boston also is a terminus of an overland trade-route by rail with the west, whence come grain, meat and raw materials for manufacture. In the Middle Atlantic States New York is a center of trade-routes to all parts of the world. Produce from the western states is conveyed here by rail for exportation. Philadelphia is a great shipping-port for coal to the southern states and New England; and also has a large canal and railroad trade. The shipping-routes from Norfolk to New England and England are due largely to the cotton-trade. In the south New Orleans is the terminus of trade-routes to the Mediterranean, England and France. The rich produce of the Mississippi Valley and the cotton of the extreme south form the staple of its trade. The chief trade-routes between the United States and Canada are across the great lakes, *via* Chicago and *via* Buffalo to Montreal. The leading trade-routes from the Pacific Coast are to Japan, to China, to the Philippines, to Australia and to the eastern coast of South America. The Panama Canal, when completed, will open a new route not only from America but from Europe to the Pacific.

Britain is the principal center of the trade-routes of the world, especially through the ports of London, Liverpool, Glasgow and Belfast. The *Atlantic route* from British ports runs directly to New York, Boston, Philadelphia, Baltimore, Norfolk, Charleston and New Orleans. These ports are reached without the need of an intermediate coaling-station. The *Cape route* is to South Africa and Australia the Cape of Good Hope. The *Suez route* passes through Suez Canal; and commands the trade of southern Asia, the East Indies and, partly, Australia. The ports along this route, most of which are fortresses, include Gibraltar, Malta, Aden, Perim, Singapore and Hongkong. The *Plata route*, which takes its name from Plata River, leads to Brazil and Buenos Ayres. A few vessels still go round Cape Horn to Australia by this route. The *West Indian route* leads to the West Indies and Mexico; and with the completion of the Panama Canal will no doubt be extended to the Pacific Coast and Polynesia.

Trade-Schools. Under modern conditions of industry the old-time period of apprenticeship to a trade or handicraft is being supplanted by a course in a trade-school. The object in trade-schools is to give the pupil in the shortest possible time such a knowledge of the underlying principles of a particular trade and such practice in the use of its tools, that he will be able immediately after graduation to do competent work and earn good wages.

New York Trade-School was the first institution of its kind in the United States, having been founded in 1881. Its courses include bricklaying, plumbing, plastering, house-painting, steam-fitting, electrical work, blacksmithing, sign-painting, fresco-painting, steel and other metal work and drawing. Both day and night classes are conducted, and the tuition fees are merely nominal.

Several trade-schools have been endowed by private persons, sometimes with the object of enabling poor boys to learn a trade, sometimes to furnish skilled tradesmen from our own nation instead of being under the necessity of importing them from abroad. Few trade-schools have yet received state aid.

A number of large manufacturing establishments, as Hoe and Co., printing-press manufacturers of New York City, have devised a scheme of apprenticeship whereby their young men are enabled to become all-round mechanics rather than masters of only one small process. Evening classes are utilized to this end, in which instruction is given in mathematics, mechanics and drawing.

Some of the principal trade-schools in the United States are New York Trade School; School of the Philadelphia Builders' Exchange; Williamson Free School of Mechanical Trades, Philadelphia; Pratt Institute, Brooklyn, N. Y.; Waltham Horological School, Waltham, Mass.; Elgin Horological School, Elgin, Ill.; Ohio Mechanics' Institute, Cincinnati, O.; and Lowell Institute of Practical Design, Boston.

Trade-Winds are winds of the intertropical zone and of a region on each side of it for a short distance which blow from the same quarter all the year through, unless they are affected by local causes. North of the equator their general direction is from northeast to southwest, but south of it they blow from southeast to northwest. In some places they blow in one direction for half the year, but in the opposite direction for the other half. They are caused by the earth's rotation and the air's movement from the poles to the equator. The hot air rises, the cold air comes in its place, and the earth's rotation changes the direction of this from due south to southeast or from due north to northeast. It is only over the open ocean that they are continuous. The larger the ocean, the steadier the trade-winds. Hence, those of the Pacific blow more regularly and strongly than those of the Atlantic. They are

separated by a belt of calms (*q. v.*) or of variable weather. Their name comes from tread, which sailors pronounced trade, because they tread so steadily. But it also is said that they are named because of their usefulness to marine trade.

Trade-Unions. A trade-union may be defined as a continuous association of wage-earners, primarily for improving conditions of employment, secondarily for any form of mutual benefit and protection. In the strictest sense it is a combination of wage-earners engaged in the same industry or the same trade. Thus the carpenters' union is of men engaged in the same trade; the United Mine-Workers' Union is of men engaged in the same industry, though of many trades — miners proper, as well as blacksmiths, firemen etc. The Knights of Labor, on the other hand, are not a trade-union at all, as they include men who are not wage-earners; in fact, any one over 16 may join, provided he sympathize with the purposes of the order. Trade-unions are distinct from the trade-guilds of the middle ages and the succeeding centuries so far as the latter consisted either of masters or of men who, in the normal course of affairs, would become masters. The trade-union proper came into existence only when there was created a sharp distinction between wage-earners as a class and employers as a class, a distinction that arose only with the rise of methods in production that require considerable capital. Thus a man with much capital sets up a shop in which he employs many men, paying them by the day or week and discharging them when he has no further use for them. In certain lines of business, as tailoring, these shops soon drive out of business the shops where there is but one man or a few partners, with a few apprentices to assist. This innovation spread in England, about the beginning of the 18th century. At once the employees in such capitalistic shops found that, unless they combined and *bargained collectively*, they were liable to a heartless and unbridled tyranny which had been impossible under the old conditions of working; for the employer obviously has a great advantage over the individual employee, which prevents the latter making with the former a free contract in any proper sense of the term. Thus the earliest trade-unions, those of the journeymen-tailors in London and the woolworkers in other parts of England, sprang into being. The laws of England forbade such combinations; but those laws also forbade the employers to pay less than a certain wage, which was regarded as sufficient for decent and healthy living. Between 1756 and 1814, in the desire to secure foreign trade at any cost, the laws controlling wages fell into disuse and were then repealed, while the laws forbidding combinations in restraint of trade were made more rigid and were enforced with great severity against the workmen, but not against the employers. But, working steadily for the good of the men and of humanity generally, Francis Place, whose name should be remembered, though himself an employer, in 1825 secured from Parliament a repeal of the anticombination laws. In 1871 trade-unions received from Parliament full recognition.

In the United States employers and employees started without any definite restriction on combination, though the English law on the subject had some weight on the attitude of the courts. In 1821 Pennsylvania definitely declared trade-unions to be legal; but not till 1843 did Massachusetts follow suit. But the law against labor combinations has never been recognized as binding on the courts of this country. The earliest trade-unions of this country arose in New York City. They were the unions of journeymen-shipwrights (1803), of house-carpenters (1806) and of the famous N. Y. Typographical Society. Since that time the movement has developed on parallel lines in England and in the United States, conditions compelling the English labor-unions to advance somewhat more rapidly.

Between 1825 and 1880 in England and between 1810 and 1890 in the United States the trade-unions as a whole had not learnt the principle of federating the lesser branches into a central organization. The separate unions frequently indulged in useless strikes, foredoomed to failure. The central organizations that came into being from time to time turned to co-operative schemes or to political movements for which the countries were not prepared, usually of a socialistic character. There was no little corruption as well as folly among the leaders. The unions were largely restricted to the stronger trades and to favored localities. Among the noteworthy advances at this time, however, we may note the first provision for a joint conference of employers and employees (1860) held in Great Britain, in connection with the hosiery trade; the formation of some strong national unions, as the typographical union and the national associations of hat-finishers and of locomotive-engineers in the United States; and the adoption of the union label as a sign that the work so stamped has been done under the conditions of payment and employment for which the union stands. The Knights of Labor, established in the United States in 1869, had great success for fifteen years, but have now given way to federated societies of labor. The Trades-Union Congress, established in Great Britain in 1868, was at first prevented from attaining its present importance because of the restricted character of its membership.

The "new unionism" may be said to date from 1880 in Great Britain and from 1890 in this country. In Great Britain it was then recognized that unskilled labor should be admitted to the Trades-Union Congress and that missionary work to organize those trades was essential. In 1888 and 1889 the result was shown in two historical strikes in which the employees, enjoying the sympathy of the whole laboring world and of the public generally, won great victories; viz., the strike of the match-girls and that of the dock-laborers in London. As a result, the leaders of these strikes, John Burns and Tom Mann, secured control of the Trades-Union Congress, with many remarkable results. Of these may be mentioned the commencement of political activity, under favorable conditions, culminating in the formation of a labor-party, which may throw its strength to the side of any one of the great political parties which supports labor-policies; the General Federation of Trade-Unions, which in 1902 had a membership of 419,600 and in 1905 2,000,000 members; and the encouragement of municipal ownership, which has made great strides in England. To-day the Federation enjoys great prosperity and is responsible for many excellent laws passed by Parliament for the betterment of the laborer. It is especially to be noted, however, that the English unions insist on keeping the Labor-Representation Committee distinct from the Trades-Union Congress and from the Federation of Trade-Unions, believing that thereby the cause of labor is kept free from political animosities, while their political activity is less closely associated with the socialistic trend of trade-unionism. This policy has had its fruit in the promotion of John Burns to a cabinet position.

In the United States the new unionism was foreshadowed by the formation of the American Federation of Labor, the most important of our labor-organizations. It was not till 1895 that this society awoke to the realization of its possibilities, especially in the organization of unskilled and poorly paid labor. It may be said to have attained its majority at the time of the great coal-strike of 1902–3. In that strike the United Mine-Workers, under John Mitchell, successfully faced one of the largest combinations of capital that exists, the group of mine-owners and railroads that practically control the coal-product of the nation. Labor here showed its solidarity, and had the sympathy of the very people who suffered most from the strike. Between 1890 and 1900 the American Federation of labor increased from about 200 to about 550,000, the increase coming between 1895 and 1900. In the next two years it increased to over one million, and now probably includes three millions among the members of its constituent and affiliated associations in the Uaited States and Canada.

The other great federation of labor in this country is the American Labor-Union, organized as the Western Labor-Union in 1898 and changing its title in 1902. Its chief membership comes from the Western Federation of Miners. It is influential in the mining states of the Rocky Mountains and in 1902 had a membership of 150,000.

While trade-unions were legalized many years ago in all the states and by the Federal government, and while 15 states have even forbidden employers to exclude a man from employment because of his place in a union, and though cities have required their work to be done by union labor, yet the following dangers still threaten the labor movement: It is a question whether unions do not constitute a combination for the restraint of interstate commerce in the same sense that many trusts do. Again, the boycott, which is a weapon the unions insist on as lawful, has been adjudged unlawful again and again by the courts. But certain acts which amount to a boycott, — as agreeing to use only goods marked by the union-label and the sending of notices to the effect that a certain house is unfair, — *i. e.*, does not meet the demands of the union, — have been judged lawful. Congress as well as most states has passed a law to permit trade-unions to incorporate; but, as this would make them liable to be sued by employers, they have seldom availed themselves of the privilege.

Arbitration, which involves calling in a third party, is not favored by trade-unions, except as a last resort; but they have, in cases of difficulty, been found much more willing to submit their cases to arbitration than have the employers. Compulsory arbitration is little desired, as it is felt that it would stand in the way where the union is fighting to establish a new principle, a forward step in the conditions of labor.

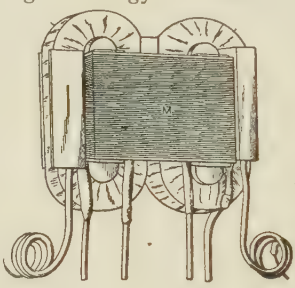
Of foreign countries, other than Great Britain, New Zealand has led in establishing compulsory arbitration, which has also been adopted in most if not all of the states of Australia and in some of the cantons of Switzerland. In New Zealand there is a board of conciliation, which first attempts to straighten out any dispute that may arise. Either party to the dispute, however, may appeal to the board of compulsory arbitration which consists of one employer, one employee and a justice of the supreme court. Strikes and lockouts are forbidden during its operation, and its awards are enforced by penalties. Consult Sidney Webb's *History of Trade Unionism;* R. T. Ely's *The Labor Movement in America;* the Industrial Commission's *Report,* Feb., 1902, especially volume 17; and *Reports* and *Bulletins* of the Bureau of Labor.

Trafalgar (*trăf' al-gär'*), **Cape,** on the southern coast of Spain, is celebrated for the great naval battle gained off its shores, Oct. 21, 1805, by the British fleet under Nelson (*q. v.*) over the combined fleets of France and Spain. The British had 27 sail-of-the-line and 4 frigates, the French and Spaniards 33 sail-of-the-line and five frigates. The British were victorious, capturing 19 of the enemies' ships. As Nelson bore down on the French, he hoisted the famous signal: "England expects every man to do his duty." At the height of the action the famous sea-captain was shot, but was told of the victory before he died. In a storm that night all but four of the prizes were lost or destroyed, a disaster which would not have happened had the dying admiral's order to anchor been obeyed.

Traill, Henry Duff, D. C. L., an English man-of-letters and editor of *Literature*, was born at Blackheath, London, Aug. 14, 1842, and died at London, Feb. 21, 1900. He was educated at Merchant Tailors' School, London, and at St. John's College, Oxford, and joined the staffs of the *Pall Mall Gazette* (1873), the *Saturday Review* (1883) and *The Observer* (1889), and afterwards became editor of *Social England* and of *Literature*. His writings (besides *Lives* of Sir John Franklin, Lord Cromer and Lord Salisbury) include *Central Government; William III* in the Twelve English Statesmen Series; *Strafford* in the English Men of Action Series; *Sterne* and *Coleridge* in the English Men of Letters Series; *Shaftesbury* in the English Worthies Series; *The New Lucian; Saturday Songs;* and *The New Fiction and other Essays on Literary Subjects.*

Tra'jan, Marcus Ulpius, Roman emperor, was born at Italica, near Seville, Spain, on Sept. 18 in 52 A. D. He was a successful commander in the wars against the Parthians and Germans under Titus and Domitian. In 91 his prestige gained him the consulship, and six years later Nerva adopted him as his fellow-ruler and successor. In 98 he became emperor, and celebrated the event by the gift of large sums to the soldiers and to the citizens and their children. He also had the state pay the expenses of bringing up the children of poor freemen in Rome and other Italian cities. In 101 Rome for the first time saw its emperor leading forth his legions in person, when Trajan set out on his first campaign against the Dacians. The conquest of the brave people, who had been paid tribute by the Romans since Domitian's reign, was not finished till 105. After going back to Rome to celebrate this conquest, the first since the time of Augustus, he started to wage war in the east. Armenia, Parthia, Mesopotamia and northern Syria and Arabia were conquered or reconquered, and Trajan was the first Roman general to sail down the Persian Gulf. Trajan's government was of the best. Under his rule the laws were carried out with justice, and the governors were held to strict account. Military roads, canals, bridges and towns were built. Trajan's wall, a line of earthworks from the Danube to the Black Sea, was raised, and Rome was beautified; among the improvements were Trajan's forum and the famous Trajan's column, whose bas-reliefs still tell the story of his military achievements. He died in August, 117 A. D.

Transform'er, an apparatus for converting the energy of an electric current into the energy of a secondary electric current. There are two kinds of transformers in commercial use: the static or alternating current transformer and the rotary transformer. The A. C. transformer converts a primary A. C. into a secondary A. C., but so that the product of the current and pressure or potential (ampères x volts) of the primary current is practically equal to the corresponding product of the secondary current. Thus, an ordinary electric-lighting transformer transforms one ampère at 1,000 volts into ten ampères at 100 volts etc. This is a "step-down" transformer. In a "step-up" transformer the voltage or pressure of the secondary current is higher than that of the primary current. Transformers are used on account of economy of distribution of electric energy. It requires a much smaller wire to transmit a given amount of electrical energy economically at 1,000 volts pressure than to transmit the same amount of energy at 100 volts. But the higher voltage cannot be well and safely used for many purposes, as for incandescent lamps. So the current is transmitted on the main wires at the higher pressure and transformed down to the lower pressure by an A. C. transformer just before passing into the house where it is to be used. Previous to 1883 practically all the electric lighting from central stations was done by direct current, but the successful application of the A. C. transformer by Gaulard and Gibbs, Stanley and others so reduced the cost of the transmission lines, that within a few years practically all the central-station incandescent lighting was done by the A. C. systems. The A. C. transformer is simply a form of the induction-coil (*q. v.*) but has an alternating current in the primary coil instead of a make-and-break device. It consists of two separate coils of insulated wire, having a laminated-iron core common



COILS AND CORE OF AN A. C. TRANSFORMER

to both coils. The primary A. C. current is sent through one coil, and this induces a secondary current in the other coil and its circuit. The ratio of conversion is that of the number of turns on the two coils. Thus, to transform from 1,000 volts to 100 volts (a ratio of ten to one), the primary coil has ten turns for every one turn on the secondary coil. Step-up transformers are used on long-distance electric-power lines. Thus, in a Californian transmission-line, the generators can safely generate currents at only 5,000 volts, and 60,000 volts are used on the lines. Here a step-up transformer is used at the dynamo having the conversion ratio of one to twelve, and proper step-down transformers are used at the other end of the line to reduce the voltage for power and lighting applications. The efficiency of the A. C. transformers depends on the quality of the iron in the core and upon the proper proportioning of the parts. In good commercial transformers an efficiency of 98 to 99 per cent. on full load is commonly attained.

In a rotary transformer an alternating current is transformed into a direct current or *vice versa*. A rotary transformer is a form of dynamo-machine having field-magnets and armature similar to an A. C. dynamo, but having a D. C. commutator on end of armature shaft and A. C. collector-rings on the other end. Such a machine is used in central electric-plants where it is desired to generate and transmit A. C., but it is necessary to use D. C. for street-car motors or for electro-chemical processes. See INDUCTION-COIL. A. P. CARMAN.

Trans-Isthmian Canal. See NICARAGUA CANAL and PANAMA CANAL.

Trans'it, in astronomy, means the passage of a planet across the disk of the sun or of a satellite across the disk of its primary, that is, the planet about which it revolves. Mercury and Venus have orbits which lie within the orbit of the earth, and so their transit can be observed. The transits of Venus are of great importance, as they are one of the means used to determine the sun's distance. Other methods had been tried without giving accurate results, until Halley in 1716 proposed a method of employing the transits of Venus. Accordingly, the transits of 1761 and 1769 were observed in various places, and in 1842 Encke from these observations reached a generally accepted result. A transit can take place only when the planet is in a line between the earth and the sun. There always are two transits of Venus eight years apart, and then a lapse of 105 or 122 years, when another pair of transits occurs, with eight years between them. The transit of 1874 was followed by that of 1882, but there will not be another until 2004. Mercury is nearer the sun, thus having a shorter orbit and year and therefore more frequent transits.

Trans'it-Instrument, an especially improved and refined telescope, mounted at right angles to a horizontal axis on which it revolves, and used at observatories and meteorological stations for observing transits or the passing of a heavenly body between the observer and another more distant body of larger apparent surface in the heavens. It is used in connection with a clock for noting the time of transit at a given meridian.

Transkei (*trăns'kī'*), is a part of Cape Colony, lying on the coast just south and west of Tembuland. It has an area of 2,552 square miles and a population of 177,730, of whom 1,707 are whites.

Transmis'sion of Pow'er, a branch of mechanical engineering treating of the means of transmitting power from a point where it is generated to the point where it is to be used. For short distances, as in a machine-shop, shafting and belting are commonly used. For longer distances four systems have been used: the wire-rope, pneumatic, hydraulic and electric systems. The above division does not include the indirect method of carrying gas to the point where it is to be used, in a gas-engine or otherwise, nor the method of carrying live steam to considerable distances from the boiler, a method which is only resorted to in extreme cases. The question of transmitting energy not only is one of engineering possibility, but involves economical questions. Some of the questions that have to be considered are the losses along the line of transmission due to friction (mechanical or electrical) or other causes; the deterioration of the installation; interest on the investment; the cost of attendance; the number of horse-power to be transmitted; the number of hours in the year of full load; the cost of power at the two ends of the line; besides questions of convenience etc.

In wire-rope transmission the power is transmitted by a wire-cable carried over pulleys between the two stations. It is used in street-car systems (see CABLE-ROADS), manufactories, mines etc., and for distances up to three miles is commercially efficient, provided the load is large and continuous. Beyond that the efficiency decreases very rapidly, owing to the cost of installation and the dead weight of cable to be carried. In hydraulic transmission water is carried under pressure in pipes or conduits, and hydraulic motors of some form used. The losses in the pipes are decreased by decreasing the velocity of flow and increasing the pressure, but these conditions require large and strong pipes, items adding to the cost of installation and therefore to the interest-charges. The efficiency of hydraulic transmission is always low, 50 per cent. or less, but it is well-adapted for short distances where great forces are required as in lifting large loads and exert-

ing great pressures. In pneumatic transmission the power is transmitted by compressed air in pipes to pneumatic engines and tools. It is a system used largely in mining where pneumatic drills are used, and within a few years its use in connection with many machine-tools has greatly extended. Pneumatic tools, as riveting-machines, drills, presses etc. usually are very convenient in operation, and although the mechanical efficiency of the whole system is low, owing to the thermal losses in compressing the air, the use of pnuematic transmission for short distances is increasing, owing to convenience of operation, flexibility and portability of tools. In mining and tunneling it has the great additional advantage of furnishing necessary ventilation along with power. For efficiency, flexibility, economy of operation and cost of operation no system of power-transmission can compete with electrical transmission for longer distances. For longer distances, as 25 to 100 miles, it is the only system by which power-transmission is possible, and even for short distances, as in machine-shops, it is competing with belts and shafts. Many shops and factories are to-day putting in motors for each machine, and thus doing away with belts and shafting. Long distance power-transmission by electricity is the most notable engineering achievement of recent years. It began in the experimental plant of Marcel Deprez at the Munich Exposition of 1882. The line was from Miesbach to Munich, a distance of 37 miles, the power transmitted was ½ H. P., and the pressure was 1,350 volts. The dynamos and generators were similar Gramme machines. This plant was of small magnitude, but it established the possibility of long-distance transmission. During the next few years power-transmission was developed largely in the way of stationary motors operated on central-station lines and especially in electric railways. (See ELECTRIC RAILWAYS.) Economical transmission of electric energy for long distances requires high voltages, and high voltages cannot be handled easily except in alternating-current apparatus (see TRANSFORMER), so that long-distance transmission was not fully developed until the invention of the successful A. C. motor, the polyphase induction-motor. (See ELECTRIC MOTOR.) In 1891 an experimental line from Lauffen to Frankfort-on-the-Main was shown at the Frankfort Electrical Exhibition, in which over 100 H. P. was efficiently transmitted 110 miles at 20,000 volts by the use of three-phase A. C. apparatus. Since then numbers of large commercial plants have been installed, transmitting thousands of H. P. from three to 35 miles. The Fresno, Cal., Folsom-Sacramento and Niagara Falls plants probably are as notable as any of these plants; but the plants at Lachine Rapids, Montreal, at Portland, Ore., of the Standard Electric Company of California and several plants in Switzerland and Italy are equally interesting to the engineer. In the Fresno plant 1,000 H. P. is transmitted 35 miles by a three-phase system from a water-plant in the Sierras to Fresno. Sacramento, Cal., is supplied by a similar system, with about 4,000 H. P. from the falls at Folsom, 23 miles away. At Niagara Falls 50,000 H. P. is generated by ten dynamos, run by turbines, and the power is distributed as far as Buffalo, 27 miles away. The Standard Electric Company's lines bring electric power into San Francisco and San José from a point in the Sierra Nevada. The electric cars and lighting of San José are supplied by electric currents generated 83 miles away. All these long-distance lines have been built to transmit the power from water-power, but it is one of the plans of the future to establish generating-plants at the mouth of coal-mines and transmit the power instead of the coal to cities within a radius of from two or three hundred miles. See NIAGARA FALLS CITY and NIAGARA POWER-PLANT. A. P. CARMAN.

Tran'spira'tion (in plants), the loss of water by evaporation from a plant. Since 50 to 98 per cent. of the plant-body is water, it loses water whenever the air contains less moisture in proportion to its capacity than the plant. Transpiration therefore is unavoidable under the conditions of most land-plants. To reduce this unavoidable loss, the larger land-plants make the outer tissues of the aërial parts nearly waterproof. But the air-passages (see AËRATION) permit evaporation from the cells bounding them; hence the moisture diffuses through the stomata (*q. v.*) to the outer air. Were evaporation prevented by waterproofing these cells also, the absorption of gases for food-making and respiration would be nearly impossible. The amount of transpiration varies greatly in different plants according to their structure and contents; in the same plant it varies with age and the varying external conditions, as temperature, light, moisture etc. Therefore, only a very general idea can be given of the amount of water transpired. On a hot summer-day a plant with five square meters (about six square yards) of foliage (such as a thrifty sunflower as high as a man might have) will evaporate about 1.2 liters (2.5 pints) of water. A birch 40 feet high, with perhaps 200,000 leaves, will give off on a hot day 300 to 400 liters of water (about 2.5 barrels). But these rates would not be kept up as an average through the growing-season. The evaporation from a leaf-surface is 2 to 7 times less than that from an equal area of water.

Transplant'ing, a horticultural process, the transference of plants, as trees, from a nursery or from their native habitat or of

young flowers and garden-vegetables to take advantage of the start given them under protection. Tree-seedlings should not be transplanted till the spring following the planting of the seeds. Young trees three or more years old are best transplanted in the autumn when the leaves are falling. Fall-planting enables the small root-fibers to make a start before spring and permits the trees to be cultivated early. The roots should be pruned to leave no ragged wounds. Young trees with a taproot should have it cut to one third its length at the first transplanting. This promotes thrift and makes any subsequent transplanting easier. As about half of a young tree's roots are injured in transplanting, that much or a larger proportion of the top should be cut back. Large trees must be transplanted to soil of the same character as that in which they have been growing. A hole for a large tree, dug in stiff clay, is apt to become a drainage-sink for surface-water, in which the roots are flooded and deprived of air. (See DRAINAGE.) The bottom of the hole should not be concave, deepest in the center, but dome-shaped, deepest at the edge, with a couple of deep post-augur holes for drainage. This shape of bottom conforms to the spreading habit of the roots.

Garden-vegetables are started indoors or in hotbeds (*q. v.*) and are transplanted to give them the greatest advantage of the growing season and to bring the best early-market prices. The seeds are planted in fine, rich earth, usually in shallow trays or pots, and transplanted at various degrees of growth. The treatment of a few common and typical vegetables involving transplanting is given below. Cabbage: The seeds for the early crop are started under glass 30 or 40 days before the ground is fit. Plants from three to five inches high may be transplanted, if properly hardened, to the permanent patch, in middle latitudes, as early as May first. Celery: Seeds are sown under glass in February; small plants are transplanted for thinning out when large enough to handle, when the taproot is destroyed; they are transplanted a second time when well-established. In the final transplanting the plants are set in trenches or on the ground, and are covered. Lettuce comes up very thick, and, if sprouted indoors, may be transplanted when large enough to handle. Tomato: Seeds are started eight or ten weeks before setting out of doors, and are transplanted two or three times, using larger pots each time and giving a light dressing of nitrate of soda or of liquid manure. Sweet potato: The tubers are laid three or four inches deep in a hotbed three or four weeks before frost is over. The sprouts are broken from the tuber when four or five inches long and well-rooted, and are transplanted to the field, where they will form vines. Their tips, if cut off six to nine inches long, can also be planted to form other vines. On a small scale the above mentioned and other seeds can be sprouted in window-boxes indoors, but must not be subjected to too great extremes of temperature. See HOTBED.

Trans-Sibe'rian Railway. See SIBERIAN RAILROAD.

Transvaal (*trăns-väl'*), formerly the South African Republic (1833-1902), is a British possession in Africa. It lies between Vaal River and Limpopo River and is bounded by Matabeleland (Rhodesia) at the north; Portuguese East Africa and Natal on the east; the Orange Colony to the south; and Bechuanaland on the west from Orange River to Southern Rhodesia. Swaziland was a protectorate of the former republic, which had an area of 119,139 square miles, but the transfer of the Vryheid and Utrecht districts; of Swaziland; and of part of the Wakkerstroom district to Natal reduced the area to 111,196 square miles. So Transvaal is of quite the same size as Arizona.

Surface and Climate. The land consists mainly of a plateau 3,500 to 5,000 feet above the sea. Lying in the same latitude south as Florida lies north, it has a semitropical climate, which, however, is dry and admirably adapted for settlers from temperate climes. The plateau is bounded eastward by mountains rising 8,275 feet that shut off the winds of the Indian Ocean, while deserts west of Transvaal dry the winds from the Atlantic. It is crossed in the north by the Zand Mountains and in the south by the Witwatersrand (Whitewater Ridge). Its chief rivers are the Vaal and Limpopo, and it has some large lakes. Both the mountains and the plateau are exceptionally rich in coal, cobalt, copper, diamonds, gold, lead, saltpeter, sulphur and tin. The soil, if irrigated, would be well-suited to agriculture, but the rainfall is deficient; and the forests, chiefly acacias, are only of slight extent.

People and Government. The country was first occupied in 1833-7 by Boers from Cape Colony, among them a boy destined to become famous as President Kruger, who named their land Transvaal because it is across beyond Vaal River. In 1856 they became a republic, but factional troubles, unwise administration and wars with the natives led to annexation by Great Britain in 1877. In 1881, in consequence of fighting against England, the republic regained independence, subject, however, to British control over its foreign affairs. The discovery of the Witwatersrand goldfields (1885) attracted great numbers of foreigners, chiefly British, and finally occasioned annexation again to Britain in 1900. (See BOER WAR). The population is 1,261,836 (that of Swaziland being 5,491), of whom

over 300,000 are whites. Only 100,000 of these are Boers, and their chief occupation is stock-rearing, agriculture being only slightly practised. The government is administered by a governor, who appoints a cabinet, and by a legislature consisting of a council and an assembly. The legislature meets annually, but the governor may prorogue or dissolve it, and it can not continue more than five years. Botha, the famous Boer general, is premier, and three other Boers hold cabinet-offices, non-Boers having only two. The government departments include agriculture, lands and native affairs, mines, public works, the secretaryship and the treasury, the minister of mines being the attorney-general also and the minister of agriculture the premier. Pretoria, with a white population of 21,161 is the capital. Johannesburg, the mining center of Witwatersrand, is the metropolis of Transvaal and the fourth city of Africa, having a total population of 158,580. (The high commissioner for South Africa administers Swaziland, but the laws of Transvaal rule it. Only 890 of the people are whites).

Education and Religion. Education is progressing rapidly, being free wherever an average attendance of 30 children can be had. Out of 258,826 whites in 1904, who were at least five years old, 227,100 could both read and write. In 1907 there were 344 farm-schools teaching 10,798 children, 209 town-schools with 11,206 pupils and 140 colored schools with 24,993 scholars. (Among the million blacks over five years of age 22,089 in 1904 could read and write). Pretoria has a normal college, Johannesburg a technical institute of engineering and mining. The Dutch Reformed Churches claim 147,319 members; the English Church 68,390; Methodists number 38,152; Jews 15,481; Presbyterians 20,879; Roman Catholics 16,481; Lutherans 64,257; other Christians 24,008; and Brahmans and Buddhists 11,440. The *white* members of the Dutch churches number 143,015; of the Anglican church 55,094; of the Presbyterians 18,682; of the Methodists 17,206; of the Roman Catholics 14,474; of the Lutherans 5,279; and of other Christian churches 14,259. The other members of these churches are non-white. The Brahmans and Buddhists however claimed 747 white coreligionists.

Resources, Commerce, Communications. Industries are hindered by the insufficiency of the communications and particularly by the lack of unskilled labor for the mines. As the natives are not available, coolies are imported. The state's principal sources of revenue are the customs and the mines, but it is by no means self-supporting. The principal imports are provisions, machinery and clothing. The chief exports include gold (6,451,384 ounces fine in 1907), wool, cattle, hides, coal and diamonds (value in 1906 about $7,500,000). The gold-deposits are among the foremost in the world, gold-mining the supreme industry. Gold was discovered before 1875, and in 1907 about $940,000,000 had been mined. In 1907 the yield was $129,000,000. John Hays Hammond calculates that $3,500,000,000 remain to be extracted and that within 30 years nearly all the paying deposits will probably have been exhausted. The Pretoria diamond-fields rival those of Kimberley, the world's hugest diamond (*q. v.*) having been discovered in Transvaal. Nearly 2,200 miles of railway are open, about 400 are under construction, and several hundred are projected. The Transvaal and Orange railways are under joint control, and nearly $30,000,000 are to be spent on new roads. There are 2,500 miles of telegraph, communicating with inmost Africa as well as the outside world; 769 miles of telephone; 393 postoffices; and seven great banks, including the postal savings-bank. Transvaal's population should increase greatly for another decade. Even if its gold-mines become exhausted by 1935, farming, grazing, manufacturing and the remaining mineral resources ensure the permanence of population and prosperity. See BOERS and KRUGER.

Tran'sylva'nia, formerly a principality of the Austro-Hungarian empire, but since 1868 incorporated with Hungary, on the southeast of Hungary, separated from Rumania by the Transylvanian Alps, in which are found peaks 8,000 feet high. Other ranges cross the country, and divide it from Hungary proper. Gold, silver, quicksilver, copper, lead, iron, tin, coal, alum and salt, with such precious stones as garnets, agates, amethysts, carnelians and jaspers, are found. A bed of rock-salt (*q. v.*) from 60 to 80 miles wide extends through the whole country. The valleys are very fertile, and raise large crops of corn, hemp, flax and tobacco. Woolen and silk goods, paper, gunpowder, glass, soap and furniture are among the more important manufactures. The people are made up of various races, as Magyars, Saxons, Rumans, Armenians, Greeks, Jews, Bulgarians and Gypsies, the Rumans numbering about three fifths of the whole. There is a university at Klausenburg (Kolozsvár), opened in 1872. Transylvania belonged to Dacia in the time of the Roman empire, and after being overrun by Huns, Goths, Lombards and Bulgarians was finally conquered by the Hungarians in the 10th and 11th centuries. It was independent in the early part of the 16th century, but in 1713 was annexed to Austria. Area 21,512 square miles. Population 2,284,048.

Trap, a class of igneous rocks, that is, those rocks which owe their origin to fire, called *trappa*, a stair, because they break up in columnar forms, producing cliffs that

stand out in great steps on the sides of hills and mountains. They are made chiefly of feldspar and pyroxene. Trap-rocks when freshly broken usually have a green color, some being a very light green and others nearly black; the weathered surfaces are usually rusty in color. Some trap is very compact, looking like flint. Basalt is a dark, heavy variety of trap-rock. The Palisades on Hudson River just above New York City are cliffs of trap-rock.

Trap'ping is a form of the pursuit of animals which is unsportsmanlike and commercial; although it is sometimes employed abroad against lions and other beasts for self-protection. The most familiar form of trapping, perhaps, is the taking of fish. Netting fish is a form of trapping; and is done either by a gill-net into which the head of a fish enters, so that its gills are caught, or by a cast net which extends from top to bottom of the water or by a trawling-net dragged behind a moving vessel. Fish are often trapped in nooses, cages and baskets. Traps for rats and mice generally belong to the *spring*-type. Traps of this kind are sometimes cruelly armed with iron teeth; tney may be used against animals of every kind. Some animals, as rabbits, may be trapped in nooses which possess a tightening slipknot. Birds are often taken by such nooses, which catch their feet and hold them prisoners. Large animals are sometimes taken by a *fall-trap*, in which a heavy weight is loosened by a touch in such a way that it crushes the animal beneath This is the principle of the *box-trap* also; but in a box-trap the animal is uninjured by the fall of the lid which imprisons him. An ancient method of trapping large animals is by means of pits loosely covered with earth. This method is laborious, but useful in the case of big game, as bears, elephants, wolves and even lions. Some animals, as deer and wild horses, may be driven down a V-shaped passage into a corral or enclosure. Trapping is an important form of the pursuit of fur-bearing beasts; since it is economical and neither injures the fur nor is apt to terrify other animals. See TRAWLING.

Trasime'nus, Lake. A shallow Italian lake lying between the towns of Cortona and Perugia, about ten miles long by eight in breadth. There was no outlet until 1896, when an artificial one was opened, draining a wide, frequently overflowed margin which has been planted in eucalyptus trees. On the farther removed slopes are olive-plantations. The lake contains three small islands. It is memorable as the scene of Hannibal's victory over the Romans under Flaminius in 217 B. C. Fifteen thousand Romans were slain, 10,000 captured, Hannibal losing only 1,500 men.

Trav'erse City, Mich., the seat of Grand Traverse County, on Grand Traverse Bay, an inlet of Lake Michigan, at the mouth of Boardman River, also on the Grand Rapids and Indiana, the Pére Marquette and the Manistee railroad, 55 miles northeast of Manistee. It is reached also by steamer from Chicago, and has steamboat connection with the chief ports on Lake Michigan. It is situated in a good farming and fruit-growing region, has a fishing-trade on the lake, and is an attractive resort in summer. The Northern Michigan Insane Asylum has its seat here. The city also has a public library and fine municipal buildings. Its trade is varied and growing, and (besides machine-shops, furniture, sash and door, shingle and lumber products) includes considerable industry in making baskets, oval wood-dishes, corn-starch, floorings, interior finishings, wagons and sleighs. Settled early in the 50's, Traverse City was incorporated in 1895. Population about 11,000.

Trawl'ing, one of the many modes of catching fish, as cod, haddock, herring, soles, on the fishing-grounds off the American coast and in its bays and estuaries, as well as off the Newfoundland "banks" and off other countries of the world. In the Great Lakes of North America, as well as in deep-sea fishing, pound, gill and drift nets, seines and herring-weir, besides the hook and line, are used to trap fish, in addition to dredges, with fine-meshed nets, for obtaining oysters, scallops, clams, lobsters etc. The trawl in common use is a triangular net, purse-shaped, 60 or 70 feet in length, with a breadth at the mouth varying from 30 to 40 feet; this is fastened to a wooden beam, which keeps the net open, and is supported by two upright frames, called trawl-heads. The net, on its underside, has a deep, curved margin, attached to the ground-rope; the trawl itself having two deep pockets so adjusted that the fish, when caught, are unable to escape; while two long, stout ropes fasten the net to the trawl-heads, with a lengthy towing-line appended. The vessels engaged in trawling are generally visited periodically by swift-sailing cutters, which bring the fish, packed in ice, fresh to market. See TRAPPING.

Treas'ury, Depart'ment of. See UNITED STATES, DEPARTMENTS OF THE.

Treaty of Ports'mouth, The, which closed the war of 1904–5 between Russia and Japan, was signed at Portsmouth, N. H., on Sept. 5, 1905, by the envoys of Japan and Russia; and on Oct. 14 by the Mikado and the Czar. President Roosevelt of the United States had urged peace on the belligerents as early as June 2, 1905. As a result, negotiations for peace were begun; and on June 10 Russia agreed to receive the proposals of Japan. Plenipotentiaries were appointed to meet at Washington, D. C., but Portsmouth, N. H., was chosen

as the place of discussion. The principal articles of agreement were concluded between Aug. 8 and Aug. 31. It was agreed that Japan should have a protectorate over Korea, that Manchuria should be left to China, that Chinese territory should be safeguarded, that an "open-door" policy was to be maintained for the commerce of all nations with China and that the Liaotung peninsula should fall to Japan, with half of the island of Sakhalin. An armistice was concluded between Russia and Japan on Aug. 31; and on Oct. 16 the text of the treaty was published. Its terms were considered liberal to Russia, since she escaped an indemnity and gained railway concessions from China. See CHINA, JAPAN and RUSSIA.

Trebizond (*trĕb'ĭ-zŏnd*), a Turkish seaport on the Black Sea. It is surrounded by hills, which take in many gardens as well as the town, and is defended by forts and a citadel. There are mosques and Greek churches, copper-foundries, dye-works etc. Its large trade with eastern Europe and Central Asia makes it, next to Smyrna, the chief commercial city in Asia Minor. Trebizond was a flourishing town when Xenophon and the Ten Thousand reached it on their retreat from Persia (B. C. 401-400). After it was conquered by the Romans, it rose in importance, Trajan giving it a larger and better harbor. When the crusaders took Constantinople in 1204, Alexius I of the imperial family founded the empire of Trebizond, till then a province of the Byzantine empire. It remained independent till captured by the Turks in 1461. Population 135,000.

Tree, the climax form of vegetation. There is no line of separation between shrubs and trees, but when a woody plant rises from the ground as a single shaft which is higher than a man, there is general consent to call it a tree. Not only do ordinary trees of temperate regions continuously increase in height, but their trunks and branches increase in diameter. As a rule, during each growing-season a cylinder of new wood is laid down around the old wood. In a cross-section these successive cylinders appear as concentric rings, and by counting the rings the approximate age of a tree is obtained. This habit of adding new wood each year, which increases the conducting capacity of the stem just so much, enables the tree to increase its display of branches and foliage each year. Such a habit is found only among the gymnosperms and dicotyledons. In the former group the leaves are mostly persistent, the trees being commonly called evergreens; while the dicotyledonous trees of temperate regions are mostly deciduous. The palms are common illustrations of monocotyledonous trees, in which there is no increase in diameter, hence no branching worthy the name and no annual increase of foliage display. The tallest trees, species of the Australian genus *Eucalyptus*, do not quite reach 500 feet. The largest trunks range in girth from 80 to 100 feet, and are developed by such forms as eucalyptus the sequoia, bald cypress and the baobab-trees of Senegal. A Mexican bald cypress is on record with a girth of 112 feet. See FOREST.

Tree-Dwell'ers are native tribes of the Australasian archipelago whose houses are built upon piles. They thus are elevated from four to eight feet above the ground,

and are entered by a narrow ladder-like stairway of bamboo which may be drawn up at will. Where tribes fear attack from human enemies, their houses often are perched high in the air, either on long piles or in high trees. The dwellings of the wild Tagbannas and the Gaddanes of the Philippine Islands are of this type.. The Papuans of New Guinea have *dobbos*, houses built in high trees, their use being chiefly that of an acropolis in times of danger, but some tribes who are especially harassed by warlike neighbors appear to live entirely in them. In Sumatra a similar house is called the *balai*. The head-hunting tribes of the Solomon Islands are most deserving of the title of tree-dwellers. The inhabitants of the island of Ysabel, a favorite hunting-ground for the more northern tribes, make no attempt at armed resistance, but have built tree-dwellings and hill-fortifications. The former are quite numerous, and are used as ordinary places of residence in times of peace. Mr. W. Coote in *Wanderings South and East* describes such a house built

in a large, hardwood tree. The lower branches had been removed; the house, which was 70 to 80 feet above the ground, was very commodious and substantial, being 26 by 18 feet, with a ridge-pole ten feet above the floor. The structure was firmly fastened. Ascent was made by means of a slender, rattan ladder, swung from the house to the ground. A supply of stones was kept in the house to drive away the enemy if they should attempt to cut down the great tree.

Trench, Richard Chenevix, an Irish clergyman and writer, was born at Dublin, Sept. 9, 1807. He studied at Cambridge, and, after traveling a few years, became a country curate; then a theological professor in King's College, London; next, dean of Westminster; and, finally, archbishop of Dublin. His principal writings are *Notes on the Miracles*, *Notes on the Parables*, *Lessons in Proverbs*, *Synonyms of the New Testament*, *Deficiencies in our English Dictionaries* and *The Study of Words*. He helped (1870-81) to revise the King James' version of the New Testament. He died at London, March 28, 1886.

Tren'ton, N. J., capital of New Jersey and county-seat of Mercer County, on Delaware River, 33 miles from Philadelphia and 59 miles from New York City. It is served by the Delaware and Raritan Canal and Pennsylvania and Reading railways, and has trolley-connections with Philadelphia, New York and the principal cities of New Jersey and eastern Pennsylvania. It was settled in 1680, named in 1714 after William Trent who owned the site, and became the capital in 1790. Trenton was the scene of a battle, by some authorities considered the turning-point in the Revolutionary War, on Dec. 26th, 1776, when Washington crossed the Delaware, surprised the Hessians, and took over one thousand prisoners. The state-buildings include the capitol, asylum for the insane, reform-school for girls, prison, arsenal, armory, library and museum, normal-school and school for the deaf. Other prominent public buildings are the public library with 40,000 volumes, Federal court and post-office, city-hall, court-house, three hospitals, 48 churches and 30 public schools. There also are seven parochial schools, three business colleges, St. Francis College and a number of private schools. Among the most interesting historical buildings is the old French-and-Indian barracks, built in 1758. Battle Monument, 150 feet high, marks the position of the artillery under Col. Knox and Captain Alexander Hamilton at the opening of the Battle of Trenton. The leading industry is the manufacture of pottery. There are 36 potteries in the city. They manufacture all classes and grades of ware, from the commonest to the finest porcelain and china. More than half of all the pottery made in the United States is made in Trenton. The principal industrial plant is the iron-works and wire-mills of the J. A. Roebling Sons Co. (builders of the first bridge connecting Brooklyn and New York.) John A. Roebling, the founder of the company, was the engineer who designed the first important suspension-bridge in America, that over Niagara River. There are numerous other manufactories of iron and steel, structural iron, cables, chains, wire-cloth and netting, anvils, vises, iron and brass castings, engines and machinery. There are many brick and tile works, rubber-works, oil-cloth and linoleum factories, furniture-factories, spring-bed and mattress factories, woolen mills, breweries and cigar-factories. The various industries employ about 19,000 men. Population 86,355.

Trian'gula'tion, a branch of surveying and geodesy, in which the positions of points on the earth's surface are determined by measuring with great accuracy a base-line and then constructing triangles on this. By measuring the angles and knowing the base line, the other distances become a matter of trigonometrical calculation. In connection with the survey of the United States being made by the coast and geodetic survey, a series of such triangles extending across the country has been fixed with great accuracy. The exact shape of the earth is determined from such triangulation in connection with astronomical observations of latitude and longitude.

Trib'unes, Roman, were popular magistrates elected annually from among the *plebs*, Romans not of noble birth, to safeguard popular interests. According to tradition the right of election of tribunes was wrested by the plebeians from the patricians in B. C. 494 by the device of a secession. The rights and powers of the tribunes gradually increased. From the first they had the right of protecting accused plebeians; and their persons were inviolable. Their principal acquired power was that of veto of a proposed law. The tribunes had by the time of the Gracchi become serious rivals of the consuls, the chief magistrates. Their number was increased to as many as ten; so that in politics any one of ten officials might obstruct legislation. As in the case of the Gracchi, the tribunician power was often over-ridden and was finally usurped by Octavian when he became emperor under the title of Augustus. In addition to these tribunes of the people there were officers in the Roman army with the title of tribune. The name in this sense originally meant an officer of the tribe; and may be traced back to the ancient tribal organization of the Roman army. There were six military tribunes in each legion, at first chosen by the consuls, but afterwards elected in the assembly of the tribes. Their powers were wholly military, not political.

Trichina (*trĭ-kī'nȧ*), a minute worm, parasitic in the muscles of swine and some other animals and very dangerous, since it can be transferred to man. The transformation comes by eating raw or imperfectly cooked pork. This worm (*Trichina spiralis*) was discovered in 1835 by Richard Owen. It is about one twenty-fifth of an inch long. When quiet, it lies coiled in a capsule or cyst within the muscles of the infected animal. When infected meat is eaten by man, the capsules are dissolved within the stomach and the worms set free An immense number of new and very minute worms are soon produced — each female being able to supply 1,500 to 2,000 eggs. The newly hatched worms bore through the walls of the intestines and get into the blood-vessels and lymphatic passages, and are thus carried all over the body. They make their way from the blood-vessels into the muscles, and there become full-grown and inclosed in capsules. From that time they are quiet, and, if the patient can survive the period of migration, he recovers. The connection of this worm with the disease was made known about 1860 by Leuckart, Virchow and others. It is difficult to say how swine become infested, but the worm is found in the rat, and as these are about slaughter-houses and sometimes eaten by pigs, the infection may come in that way.

Trichogyne (*trĭk'ō-jĭn*), (in plants), a tubular, hair-like process developed from the female organ (*carpogonium*) of the red seaweeds. See RHODOPHYCEÆ.

Trichome (*trĭk'ōm*), (in plants), a general term applied to outgrowths from the epidermis, chief among which are hairs. See HAIR.

Trieste (*trê-ĕs'tȧ*), a seaport of Austria (*q. v.*), at the head of the Gulf of Trieste, on the Adriatic Sea, 90 miles northeast of Venice. There is an old town, with narrow streets and black walls, built on the slope of a hill and surmounted by a castle. Its cathedral has stones with Roman inscriptions built into its walls and a tower resting, it is said, on the foundation of a temple of Jupiter. The new town, on the plain toward the sea, is a handsome city with a fine harbor. There are extensive manufactures for making soap, rope, white lead, wax and leather. The people are Germans, Italians, Greeks, Jews and Dalmatians, but the majority speak Italian. Trieste, as Tergeste or Tergestum, was plundered by neighboring tribes as early as 51 B. C. In 1382 it passed into the hands of Austria. Population 205,136.

Tri'lobite, among fossils, any individual of the order *Trilobita*, so called from the division of the external skeleton into three regions. These comprise a cephalic shield or head; a variable number of body-rings; and a caudal shield or tail. They vary greatly in size, some being scarcely larger than a pin's head, while species of *Asaphus* have been met with that are two feet in length. They appear to have lived in shallow water, feeding on small marine animals. They are found in large numbers in the paleozoic system of rocks.

Trinidad (*trĭn'ĭ-dăd'*), the most southern of the West Indies, lies off the coast of Venezuela, nearly opposite the mouth of the Orinoco. It is 50 miles long and from 30 to 60 wide, and includes 1,754 square miles. The two channels to the harbor are called the Dragon's Mouth and the Serpent's Mouth. On the northern coast are forest-covered mountains, one with two peaks, called Tamana, while the rest of the island abounds in fertile valleys and plains. There are some good-sized rivers and several fine harbors. A lake, with pitch floating on its surface, is one of the curiosities of the island. (See ASPHALT.) The most important products are cocoa, sugar, rum, molasses, coffee, cotton, cocoanuts and oil. There are 250 public schools, with 40,956 pupils, many private schools, Queen's Royal College and a Roman Catholic College, with a total of 427 students. The chief town, Port of Spain, originally built of wood, was burned in 1808. The new town, built of stone, is one of the finest in the West Indies. The island was discovered by Columbus in 1498 and named Trinidad, because he first saw three mountain-summits from his ship. In 1797 it was taken by the British from the Spanish, and in 1889 Tobago was annexed. It has 81 miles of railway and 1,147 of telegraph and telephone. There are steamship lines to England, Holland, North America and Venezula. Population 255,148.

Trinidad, Colo., a city, the seat of Las Animas County, in the eastern foot-hills of the Rocky Mountains, on Las Animas River, and on the Denver and Rio Grande; Atchison, Topeka and Santa Fé; and Colorado and Southern railways, 85 miles south-southeast of Pueblo. In the vicinity there is a good farming and cattle-raising country, and it is rich in coal, and produces much livestock, alfalfa, beans etc. It has good municipal buildings, churches and schools, a public library, an hospital, an academy and an attractive park. Besides its coal-mines, railway-shops, foundry and ice-plant, it has a wool-scouring mill, a brewery, a cigar-factory, a brick-yard and bottling works. Population 5,345.

Trinity College, Toronto, Can., was founded by Bishop Strachan to secure for the youth of the church the best secular education in the arts and sciences combined with the religious teaching of the Church of England. By the generosity of churchmen in Canada and in England a liberal endowment was raised and a building erected in 1851. The college was formally opened in 1854, and its patrons laid stress on "the inestimable advantages of residen-

tial collegiate life." Sir John Beverley Robinson was its chancellor for ten years, and the Hon. John Hillyard Cameron for 14 years up to 1877. Rev. George Whittaker was its first Provost. In 1881 the Rev. C. W. E. Boddy succeeded him. Through his efforts St. Hilda's College (for women) was established. Dr. Boddy resigned in 1904 to accept the professorship of the Literature of the Old Testament in the General Theological Seminary, New York, and was succeeded by the Rev. E. A. Welch, a graduate of Cambridge. The present provost is the Rev. T. C. Macklem. Trinity Medical College, Ontario Medical College for Women and Toronto Conservatory of Music were affiliated with the University of Trinity College. After the passing of the federation act in 1887, which forms the basis of the new university constitution, Trinity accepted federation in 1903 and became a part of the federated University of Toronto. The buildings of Trinity College (Tudor front, carved stone ornamentation) are beautifully located in a park of 35 acres. Trinity's contribution during half a century to the cause of education in Ontario is inestimable.

Tripoli (*trĭp'ō-lĭ*), one of the Barbary states of North Africa, between the desert and the Mediterranean, with Benghazi covers 398,900 square miles. The Atlas Mountains, which end here, run parallel to the coast and are lower than in the other Barbary states, being not more than 4,000 feet high. There are no rivers and very little rainfall, and vegetation must depend on the heavy dews. In the coastal regions, which are very fertile, cotton, grain and tropical fruits grow, while in the interior senna, dates and carrots are grown and the lotus flourishes. Sheep and cattle are raised in large numbers, and the horses and mules are celebrated. Tripoli is a dependency of the Turkish empire, its governor being appointed by the sultan. The trade, once considerable, has declined since new routes through Central Africa have been opened and since the abolition of the slave-trade. Tripoli belonged to the Carthaginians, and was taken from them by the Romans; then, with the rest of North Africa, it passed into the hands of the Arabs and became Mohammedan; and finally it was taken by the Turks in 1552. Population 600,000.

Trip'oli, a city of Africa and capital of the Turkish province of Tripoli, is on a point of rocky land projecting into the Mediterranean. It is the principal seaport, and is built with high walls and bastions, mosques, synagogues and Christian churches. It has some important manufactures, as leather, carpets and scarfs. It is the starting-point for caravans for the Sudan, which give it a large trade, though somewhat decreasing of late years. The people are nearly all Mohammedan, but business mostly is in the hands of the Jews and Christians. Population 35,000.

Tri'reme, the name given anciently to a galley or vessel with three banks of oars. The oars were arranged in banks or rows, one above the other. The oars of the lowest rank were the shortest, and the rowers had the easiest work and the least pay. There was a small sail also that could be used with a good wind. The crew consisted of 200 men, and often they moved the vessel as swiftly as a modern steamboat. The crew was usually composed of convicts and of slaves, taken in war, and could hope for no release save that of death. The triremes were used in the Persian and Peloponnesian wars, but later the galleys were made with five banks of oars and called quinqueremes. See GALLEY.

Tris'tan and Isolde'. A music-drama in three acts; words and music by Richard Wagner. Completed in 1859, and first performed in Munich in 1865 under the direction of Hans von Bülow (1830–94). The work was written during 1857–9 — a period in which Wagner was also engaged on *The Ring of the Niebelungen.* Wagner entitled this opera *Eine Handlung* (an action). He uses the Celtic legend of Tristam and Iseult, with modifications to suit his purpose. The dying song of Isolde, with which the work closes, has been effectively arranged as an instrumental number for the concert-room.

Triumvirate (*trī-ŭm'vĭ-rāt*), the name of an office among the Romans, filled by three persons. There were triumvirates for the regulation of public affairs, mentioned near the end of the republic. The government under Cæsar, Pompey and Crassus in 60 B. C. is called the first triumvirate, but the title was never formally given to them. The first triumvirate was that of Octavian, Antony and Lepidus in 43 B. C., though usually called the second. They held office for ten years. One set of triumvirs in Rome had charge of the night-police and another of the prisons.

Trol'ley-Cars are street-cars propelled by electricity by means of a trolley, a pulley working upon a wire overhead. The name, therefore, is appropriate only to electric tramways in which a rod is used to establish a connection between the motor of the car and the wire overhead. In America, however, the name is freely applied to other forms of street-car. Steam and horses have both been well-nigh discarded from street railways; even the cable-car has had its day; and the trolley-car properly so called, or the electric tramway, now reigns supreme. In 1890 there were 500 miles of cable-car lines in the United States, 6,000 of horse-car and 2,000 of electric tramways; but in 1908 the mileage of electric tramways had increased to 41,244 miles. Of the electric

trolleys, the most rapid and convenient are the underground-car systems in use in such cities as New York, London and Boston. In an overhead-trolley the current passes along the wire overhead, down through the rod to the motor, thence to the rails and so back to the central station. In America the posts for the overhead wires usually are plain and occasionally unsightly; in Europe usually ornamental and expensive. To avoid the cumbrous overhead construction, some trolley lines are constructed on the conduit-system. This is expensive, because it is necessary to construct a complicated conduit between or at the side of the rails, having a groove opening to the street, so that the so-called plow may connect the conductors in the conduit with the motor. There also is a movement in the direction of carrying storage-batteries in the car, as in New York City's 34th Street crosstown cars. Similar storage-batteries are of use in the regulation of the current along parts of third-rail systems, as the subway of New York City. See ELECTRIC MOTOR and ELECTRIC RAILWAY.

Trollope (*trŏl'lŭp*), **Anthony,** an English novelist, was born at London on April 24, 1815. He spent 33 years in the British postal service, and visited the United States, Austria and the West Indies in its interests. He invented the postal pillar-box. Some of his stories appeared first in *St. Paul's Magazine*, of which he was editor. His novels include *Orley Farm*, *The Bertrams*, *The Small House at Allington*, *Barchester Towers*, *The Last Chronicle of Barset* and many others, as he was a most prolific writer. He also wrote a *Life of Cicero*, a *Life of Thackeray* and works on *North America* and *South Africa*. His works number 70. He died on Dec. 6, 1882. Consult his *Autobiography*.

Trom'bone, a musical instrument, a form of the trumpet. The name is from the Italian, and means a great trumpet. It is a brass wind-instrument, so made in two parts that, by sliding one part into the other or drawing it out, the tube through which the air passes can be lengthened or shortened and the depth and power of the tone changed. Three kinds of trombones are used, called alto, tenor and bass trombones, according to the pitch. The tone of the trombone is grander and more powerful than that of the trumpet, making it a very effective instrument in an orchestra.

Tromp, Martin Harpertzoon van, a Dutch admiral, was born at Briel, Holland, in 1597. He was captured at sea, when a boy, in a fight on the coast of Guinea, in which his father, a Dutch commander, was killed. He served as cabin-boy for his captors for more than two years. In 1624 he was in command of a frigate, and in 1637 was at the head of a squadron of 11 ships. His first victories were over the Spanish fleet, taking 13 ships in one battle, Oct. 21, 1639. In November, 1652, he encountered the English fleet under Admiral Blake in the Straits of Dover, and drove them before him, sailing up the Channel with a broom at his masthead, to denote that he had swept his enemies from the seas. He was defeated by the English in February, 1653, after a terrible three days' fight; and again in June of the same year, when he lost 17 vessels. On Aug. 10 the struggle between the Dutch and English was renewed, the Dutch losing 30 men-of-war and Tromp himself. He was buried at Delft.

Trop'ic-Bird, the name for three species of sea-birds commonly seen in the tropics far from shore. During the breeding-season they frequent rocky shores and cliffs, but build no nests. The more common variety, sometimes seen on the coast of Florida, is about the size of a partridge. It has white plumage with fine black markings above and black bands on its wings. These birds have the two central tail-feathers greatly prolonged, and, therefore, are called marlinspike by the sailors; and because of their loud, shrill cry, the sailors also name them bo's'n-bird. The young do not in the least resemble the adults, but look like balls of white down. From the tail of the roseate tropic-bird the Pacific islanders procure the highly-prized red feathers worn by warriors in battle.

Trop'ics, the two lines of latitude parallel to the equator, drawn, one through the winter, and the other through the summer, solstice. They are equally distant from the equator, being about 23° 28′ north and south of it, and include between them all those points of the earth's surface where the sun always is vertical or directly overhead. The northern line is called the Tropic of Cancer, because the sun, which is directly over this tropic at the summer solstice, then enters the constellation of Cancer; the southern line is called the Tropic of Capricorn, because the sun, when vertically over it, enters the constellation of Capricorn. The country between the two tropics is called the torrid or hot zone, and the temperature is known as tropical. The word tropic comes from a Greek word meaning a turning, and indicates that the sun turns back at these lines.

Troubadour (*trōō' bà-dōōr'*), in southern France, Spain and Italy a class of poets distinguished from minstrels and strolling musicians by the fact that they indulged in verse-making for the love of it, and not for money. In northern France they were called *trouvéres*. They were often attached to the courts, and were attended by minstrels or *jongleurs*, who accompanied them on musical instruments, as it was usually considered beneath the dignity of a troubadour to be his own fiddler. The

troubadours' poetry consisted mostly of love-songs, though they sometimes touched upon the wars of the period or ventured to upbraid the evil customs of the times. At court-festivals there often were several troubadours, who engaged in verse-contests on subjects suggested by the ladies of the court. They flourished about from 1090 to 1290. Among the best-known troubadours were Richard the Lion-heart, Pierre D'Auvergne and Pierre Vidal, while the counts of Provence and of Toulouse, the kings of Aragon and of Castile, King Richard and Eleanor, queen of Henry II, are among their most illustrious patrons.

Trout, the name for a number of fresh-water fishes belonging to the same family

TROUT

as the salmon. The latter also is usually embraced under the name trout. They live in cold, clear streams and lakes, and are among our best food-fishes. They naturally are inhabitants of the northern hemisphere, but have been introduced into New Zealand and Australia. The common river and lake trout of Europe are black-spotted varieties, and reach a larger size than the American river-trout. Two kinds found in the United States are worthy of especial mention, the lake-trout and the brook-trout. The former is also called Mackinaw trout. It inhabits the Great Lakes and other lakes from New Brunswick to Montana and north to British Columbia and Alaska. It reaches a length of three feet or more. The brook-trout, which really is a charr, with its minute scales and beautiful red spots, is one of the most exquisite fish in appearance to be found anywhere, and it is unsurpassed as a food-fish. It ranges from Maine to Dakota, always in cold streams. Its length is from five to twenty inches, and it reaches an extreme weight of twelve pounds. In the Rangeley Lakes of Maine specimens have been caught and weighed that exceeded even twelve pounds. The trout west of the Rocky Mountains embrace the only black-spotted trout native to the country. Some of them live in warmer streams than their eastern relatives. The rainbow-trout is black-spotted and approaches nearly to the European river-trout. The latter, with some other forms, have been introduced into the waters of the United States.

Trow'bridge, John Townsend, American novelist, poet and editor, was born at Ogden, N. Y., Sept. 18, 1827, and was partly educated at a classical school at Lockport, N. Y. Early in life he lived on a farm and occasionally taught school, and in 1847 he went to New York and began to write for the press. He removed to Boston, contributed to magazines and journals, and took actively to authorship. His chief works are *Cudjo's Cave*, *The South and Its Battlefields*, the *Jack Hazard* series, *The Drummer-Boy*, *The Tide-Mill* series, the *Toby Trafford* series and the *Start in Life* series. He has also published *The Vagabonds; The Book of Gold; The Emigrant's Story;* and *My Own Story*.

Troy, a famous city of Asia Minor, the seat of the Trojan War, which forms the subject of Homer's great *Iliad*. It was situated, according to the poem, at the foot of Mt. Ida, in the northwestern part of Asia Minor, with a plain in front stretching for nine miles, called the Plain of Troy. The city was also called Ilium. Paris, the son of King Priam of Troy, carried off Helen, the wife of King Menelaus, king of Sparta, and the most beautiful woman of her age. The Greeks, after spending ten years in collecting a fleet of 1,186 ships and an army of 100,000 men led by Agamemnon, drove the Trojans into their city, and after a siege of ten years the city was destroyed. In the tenth year of the siege occurred the quarrel between Agamemnon and Achilles which is the subject of Homer. It so weakened the Greeks that they were driven back to the sea. Vergil in *The Æneid* tells the story of the wooden horse filled with warriors, left before the walls of Troy by the apparently retiring Greek army, which was drawn into the city. The warriors, thus introduced, opened the gates to the returning army, and Troy was taken by stratagem. After the fall of Troy a new city sprang up, called New Ilium, which occupied the site of Hissarlik, about four miles from the mouth of the River Mendereh, now believed to be the Scamander of *The Iliad*. This spot has been excavated by Dr. Schliemann, and the remains of a great city found, thought to be those of ancient Troy. See ACHILLES, ÆNEAS, AGAMEMNON, HELEN, HOMER, ILIAD, ILIUM, MENELAUS, ODYSSEY, SCHLIEMANN and ULYSSES. Consult Schliemann's *Troy and Its Remains*.

Troy, N. Y., county-seat of Rensselaer County, on Hudson River, six miles north of Albany, is at the head of steamboat

navigation. There is a large dam across the Hudson, which, with two small streams falling 200 feet from hills back of the city, furnishes a large water-power. It is connected with Lakes Champlain, Ontario and Erie by canals. Among its public buildings are the city-hall, orphan asylums, Earl crematory, an athenæum and the union-station, one of the finest in the country. The city annually expends $144,220 on its public schools, which have 211 teachers and 6,357 pupils. Troy Female Seminary, established in 1821, was one of the first institutions of the kind in the country, and is still successfully maintained. Rensselaer Polytechnic Institute and St. Joseph's Theological Seminary are among its schools. The principal manufactures are of iron, its factories and furnaces being the largest in the eastern part of the Union. It manufactures bar-iron, railway-spikes, nails, screws, bolts, stoves, furnaces, hollow-ware and machinery. It has the largest factory of mathematical instruments in the country, and the shirt and collar factories are very extensive. The old Vanderheyden house, built in 1752, was the first house on the site of Troy, and the place was known as Vanderheyden's Ferry and as Ferryhook until 1789, when it was named Troy. It has been almost destroyed by fire three times. Population 76,513.

Truf'fles, the common name of certain edible fungi, belonging chiefly to the genus *Tuber*. Nearly all are subterranean and appear as tuber-like bodies developed on a mycelium. Truffles are among the most prized of the edible fungi, and are chiefly cultivated in Europe. See ÆCIDIOMYCETES.

Trum'bull, John, an American painter, was born at Lebanon, Conn., June 6, 1756. He graduated at Harvard College, and studied his art at Boston. He served in the army during the Revolutionary War as adjutant of the first Connecticut regiment, aide-de-camp to Washington, major and colonel, resigning in 1777. While studying painting in London in 1780, he was imprisoned for eight months during the excitement produced by the execution of André. His first American historical pictures were *Battle of Bunker Hill* and the *Death of Montgomery*. He painted portraits of Washington and other Revolutionary characters. In 1817 he was employed by Congress to paint four pictures for the rotunda of the capitol, and as subjects chose *The Declaration of Independence*, *Surrender of Burgoyne*, *Surrender of Cornwallis* and *Resignation of Washington*. His historical paintings, numbering 57, were given by him to Yale College, and are valuable as collections of portraits of the prominent actors of the period. He died at New York, Nov. 10, 1843. See *Autobiography*.

Trumbull, Jonathan, an American statesman, was born at Lebanon, Conn., Oct. 12, 1710. A graduate of Harvard College and a theological student, he was turned aside into business by the death of his elder brother. He became a member of the general assembly of Connecticut in 1733, speaker in 1739 and assistant in 1740, being re-elected 22 times. He was chief judge of the superior court for three years and governor of the colony for 14. He was prominent in the opposition to England before the Revolutionary War, refusing to take the oath to support the Stamp-Act, and his advice was sought by Washington, who looked upon him as one "of his main pillars of support." The name of Brother Jonathan, given to the United States, is attributed to Washington's frequent remark, alluding to Trumbull: "Let us hear what Brother Jonathan says." He died at Lebanon, Conn., Aug. 17, 1785. See *Life* by Stuart.

Trumbull, Lyman, American jurist and senator, was born at Colchester, Conn., Oct. 12, 1813, and died at Chicago, June 25, 1896. He studied law in Georgia, was admitted to the bar, and settled in Belleville, Ill., where he was elected to the state legislature, became secretary of state, and in 1848 was elevated to the bench of the Illinois supreme court. In 1854 he was elected to Congress, and in the following year became a member of the United States senate. During and after the Civil War he was a prominent Republican, acting earnestly with that party, favoring the abolition of slavery, but opposing the impeachment of President Johnson. He subsequently supported the Democratic party, and in 1880 was Democratic candidate for the governorship of Illinois.

Trump'et, a musical wind-instrument, of great antiquity. In its modern form it is a tube eight feet long, having a bell-shaped end and doubled in a long curve, about three feet long, and is played from a mouthpiece. It has a range of over two octaves. It has been used in war, and is a common instrument in military bands.

THE EAR-TRUMPET is an instrument which collects the waves of sound and carries them to the ear, thus enabling a deaf person to hear better. The small end is placed at the ear and the large end is open to the air or placed at the mouth of the person speaking.

THE SPEAKING-TRUMPET is a straight tube with a mouthpiece, which collects the sound-waves, so that the voice of a person speaking into it is louder, and the sound is carried farther.

Trumpet-Flower, a popular name for a vine with a woody stem and clusters of scarlet flowers shaped like a trumpet. It grows to a great height and very rapidly, and is found in the central and southern states of the Union, where it is often called trumpet-creeper. Other varieties from China, Japan, Australia and South

America are cultivated in gardens and greenhouses.

Trusts. In the United States this term has come to mean a form of commercial association between individuals or corporations engaged in producing the same commodity, for the general purposes of regulating the amount of production; of establishing a uniform price; of diminishing the cost of competition; and of controlling the markets, in part at least upon the principle of monopoly. Such an organization is managed by a board of trustees to whom all the corporation stock of the constituent companies is irrevocably assigned.

There are several methods of organizing a trust. Each of the combining parties may lease his concern to one central body; or one central corporation purchases as fast as they are manufactured all products of the various parties, and then a fixed price is placed on the aggregate production of each party, and trustees are elected who control the sale of the whole product and divide the products proportionally among the various companies. The more usual plan of operation is as follows: All parties entering the organization become incorporated; then the stock of all the corporations is handed over to trustees who in exchange for stock thus deposited issue trust-certificates. They also elect directors who have complete control of the affairs of the concerns associated in the trust. Trust-certificates are transferable; dividends are issued according to the proportion of certificates held by each party. Trustees are elected annually by the holders of certificates, and through the directors they possess almost unlimited power over individual concerns. They may cause one concern to stop producing altogether, may limit productions, fix prices and the amount and manner of sales; in short, they control the entire field.

To illustrate: A few years ago 16 of the large sugar-refineries in the United States, furnishing the greater part of the sugar consumed, joined in a trust with a capital of 50 million dollars. As soon as the combination was effected, five of the factories shut down. At once the margin between raw and refined sugar began to widen. To the producer of raw material they dictated the price, for there was but one buyer, and to the consumer they dictated prices, for there was but one seller. Such forms of trusts have been declared illegal in the courts of every state where the matter has been contended.

The first important trade-combination of this sort formed was that of the Standard Oil Trust in 1881. It was quickly followed by the Cottonseed-Oil, Sugar, Tobacco and Lead Trusts etc.; and by the census of 1900 there were 185 such combinations of formerly independent concerns.

Trusts are the outgrowths of the ruinous competitive system, due to ease of intercourse and the difficulty of readily withdrawing capital once invested in fixed plants. They save salesmen's salaries, competitive advertising, cross-freights, running plants part time etc. They permit the standardizing of machinery and the organization of workmen under competent leadership. The large profits made by financiers and promoters, sometimes assisted by governmental favors, have encouraged their rapid multiplication in number and size. The tariff, by lessening foreign competition, has been an indirect cause of the formation of trusts as has the monopoly granted by patents, copyrights and trademarks.

The 185 trusts noted in the census-report of 1900 included 2,040 plants having a capitalization of $1,463,625,900. Many combinations operating with a like purpose were omitted by definition, while many more have been formed since, notably the United States Steel Corporation (*q.v.*), formed in 1901 with a capital of over one billion dollars. The value of material they annually consumed was $1,089,666,334, the value of products annually turned out was $1,667,350,949, which was 14.1 % of the total value of all manufactured articles susceptible of management by trusts. It is safe to estimate that more than one third of the present factory output is controlled by trusts.

Many trusts are founded upon a natural monopoly; that is, they control the supply of raw material, and by the extension of this control they put competitors at a great disadvantage, especially when, as in the case of oil, coal and iron, these raw materials are found in limited fields and quantities. A trust may become a monopoly to the degree in which it governs the supply of raw material, for the industry which it seeks to control.

Recent antitrust movements have brought to light a number of evils peculiar to corporate finance; chief among them are wildcat promotions, payment of unearned dividends, speculative management and over-capitalization. By wildcat promotion is meant the action of the promoter who issues stock far beyond the actual cash-value of the plants under consideration. He pays for the plants with whatever stock is necessary, and retains the remainder, often securing for himself 20% of the capital of the organization, paid to him in common stock. Besides this, the man who finances the company sometimes receives a premium of 50 per cent. for his risk. The capital stock usually is both preferred and common, the preferred representing the properties, including cash and cash-assets, which receive a fixed dividend of six or seven per cent. but do not participate in

any way in earnings in excess of the fixed percentage. In case the earnings are below this rate, the "unearned dividends" must still be paid at the expense of the common stock. The common stock represents expected earning-capacity, on which the income fluctuates with the success of the enterprise.

The effect upon prices has been a subject of much discussion. It is commonly said that trusts inevitably drive all small concerns to the wall and build up a few large establishments on their ruins, and also that monopolies' price, wherever possible, is far above the price level of competition. In discussing this question we may assume that competitive prices are fixed mainly by the cost of producing that part of the output which is produced at the greatest disadvantage, and also that monopoly price is fixed at that point which will secure for the monopolist the greatest net return. While the ultimate effect upon prices cannot yet be determined, many instances show that in individual cases, for short periods of time, the trusts have actually lowered prices below the former competitive rates. Likewise numerous instances can be found of prices raised above such former rates, usually after the markets have been secured. The Industrial Commission has shown that the influence of the trusts has increased the margin between the cost of raw material and the finished product. The same investigation showed that in a few cases a trust later in its life, probably from the fear of competition, has lessened this margin. Much evidence goes to show that in the long run prices fixed by trusts will be maintained at a very little above, or possibly not at all above, competitive rates.

The social effects of the massing of capital are generally considered bad. Trusts are charged with corrupting legislatures and courts and with destroying self-reliance and self-direction among men who are combined in so centralized an organization.

The legal position of trusts has not been fully determined; it depends upon many circumstances of organization and activity. Any trust is illegal, if it can be proved that it restrains trade or that it is a conspiracy within the meaning of the law. But individual producers have a right to combine to diminish the expense of unfair competition or the cost of production. States can control trusts to a degree in granting their charters, and the national government can regulate their activity through its power to regulate interstate and foreign commerce. The Congress of 1902-3, in passing a law creating the Department of Commerce and Labor, made provision for a Bureau of Corporations which should collect data concerning the trusts, to be used in further legislation for their control.

Tsad or **Tchad** (*chäd*), a lake in central Africa, about 150 miles long and 120 wide. Two large rivers flow into it, but it seems to have no outlet, though there are signs of an ancient river-bed, bordered by trees, in which the Arabs say water flowed for 100 miles during a flood in 1870. There are populous villages on the shores, and the many islands in the lake are densely peopled by pagan tribes, dark brown or black, with regular features, wearing cotton-garments and cultivating cotton and corn.

Tschaikowsky (*chī-kôf'skē*), **Peter Ilitch,** a distinguished Russian composer, was born at Votkinsk in the province of Vyatka, April 25, 1840, and died at St. Petersburg, Nov. 7, 1893. Early in life he held a government-post in the Russian service, but this he abandoned in 1862 to study music in the conservatory of music at St. Petersburg, where he was instructed in harmony and counterpoint by Zaremba and in composition by Rubinstein. After graduating, he for a number of years was professor at the conservatory of music at Moscow, where he composed many melodies gathered from the airs of the folksongs of his native country and characterized by weird and plaintive music. Among his compositions are overtures, symphonies, concertos, marches and operas, many of which are of great sweetness and beauty. In 1889-90 he visited London, appearing there at Philharmonic concerts, and in 1891 he came to New York City at the invitation of the New York Symphony Society, where he gave renderings at Carnegie Music Hall of many of his own compositions.

Tset'se a two-winged insect slightly larger than the common fly, inhabiting portions of South Africa. Its bite usually is fatal to the ox, horse and dog, but harmless to man, the goat and wild animals living in that region. It lives by sucking blood, but its bite is not immediately fatal, the bitten animals sometimes lingering for weeks and months. It is so local in its distribution, that it is sometimes seen in swarms on one side of a river while cattle are grazing undisturbed on the other.

Tu'ber, a form of underground stem, which is much thickened by food-storage, as the common potato. It usually shows its nature as a stem by bearing minute leaves (scales) or buds, as the "eyes" of the potato. Tuber also is the name of the genus of fungi to which the truffles belong.

Tube'rose', a plant which belongs to the same family as the amaryllis, having a bulbous root; long, slender leaves; and a cluster of very fragrant, white, wax-like flowers, growing at the end of a stalk two or three feet long. The bulbs were brought at first from Holland and Italy, but now are raised in the United States, those grown in Georgia and Florida being larger than the imported

ones. It is a tropical plant, probably a native of the East Indies or Mexico.

Tü'bingen, See UNIVERSITY.

Tuck'er, John Randolph, American lawyer and statesman, son of Henry St. George Tucker, was born at Winchester, Va., Dec. 24, 1823, and died at Lexington, Va., Feb. 13, 1897. He was educated at the University of Virginia, studied law, and was admitted to the bar in 1845, and from 1857 to 1863 was attorney-general for his native state. The Civil War dispossessed him of this post, but he was appointed to the chair of equity and public law in Washington and Lee University and held that office four years (1870-4). From 1874 to 1887 he was a member of Congress, and acted frequently as chairman of the judiciary committee and of the committee on ways and means, and took an active part in the Congressional debates on the tariff. His oratory was frequently listened to in the house on many other important topics and themes of legislative import.

Tuck'erman, Henry Theodore, an American writer, was born at Boston, April 20, 1813. He spent several years in Italy in the study of art and literature. His works appeared mostly as contributions to periodicals. They include *The Italian Sketchbook*; *Sicily; Thoughts on the Poets*, translated into German; *Artist-Life or Sketches of American Painters; Book of American Artists;* poems; and essays. He died at New York, where he had resided for many years, on Dec. 17, 1871.

Tucson (*tū-sŏn'*), **Ariz.,** the largest city in the territory, is about 60 miles north of Mexico. It is 2,520 feet above the sea, in the valley of the Santa Cruz. The old part of the town looks like a Mexican city, with plazas, narrow streets and adobe houses, but the newer parts are American. The climate, mild in winter, is very hot in summer, and the yearly rainfall is only seven inches. The church of St. Xavier, built more than 100 years ago by Roman Catholic missionaries, is near the city, and the university of the territory is here. The city is supplied with gas and water, and has a large trade with Mexico and in supplying the Indian reservations. Tucson was a Mexican military post, and came into the possession of the United States by the Gadsden purchase in 1853. Population 7,531.

Tu'dor, the name of one of the royal families of England, reigning from 1485 to 1603. The family came from Owen Tudor, at one time a brewer in Anglesey, who fought at Agincourt and so pleased Catherine, widow of Henry V, by his dancing at a court pageant that she married him privately. The queen took refuge in a convent and Tudor was sent to prison to escape the popular fury, when their marriage became known. Tudor escaped, and was protected by Henry VI, the young king. The oldest son of this marriage was made Earl of Richmond, and married Margaret Beaufort, a descendant of John of Gaunt. Their son became Henry VII of England, and by marrying the daughter of Edward IV united the houses of York and Lancaster and ended the Wars of the Roses (1455-85). There were five Tudor sovereigns: Henry VII, Henry VIII, Edward VI, Mary and Elizabeth. Consult *Early Tudors* by Moberly and *History of England* (1529-88) by Froude.

Tufts College, a college (founded in 1852), controlled by the Universalist denomination, is located four miles from Boston, Mass. It comprises the college of letters, divinity school, medical school and dental school. It has 208 instructors and 1,020 students.

Tuileries (*twē'le-riz*), **Palace of the,** a famous domicile of French royalty, now destroyed, in Paris, on the right bank of the Seine and adjoining the Louvre. The site originally was a tile-field, whence the origin of the name (the word signifying a tile-kiln). The palace was commenced in 1654 as a residence for Catherine de Medici, and was enlarged by Henry IV and by Louis XIV, the attached grounds being converted into ornamental gardens. When the palace of Versailles was erected, the Tuileries ceased to some extent to be used by the French kings. In the Revolution it was stormed and sacked by the frenzied Parisian mob (1792), and for a time became the seat of the national convention which governed France after abolishing monarchy. The Tuileries were also attacked and taken in the insurrections of 1830 and 1848, and during the Commune (1871) the buildings were burned, the ruins not being removed till 12 years later. Nothing of the palace remains except the pavilions which flanked it. In their restored order they terminate the two galleries or extended arms of the Louvre (*q. v.*).

Tu'la, a city in Russia, on Upa River, 110 miles south of Moscow. It has a large cannon-factory and manufactory of arms, founded by Peter the Great, and nearly 800 other factories which supply the Russian army with arms. Cutlery, locks, tea-urns and bells are made in large quantities, and the preparation of bristles for market is a large industry. Population 114,733.

Tu'lip, species of *Tulipa*, a genus of the lily family, and native to Central Asia. They are extensively cultivated for their beautiful flowers, and over 1,000 garden-varieties have been catalogued. Haarlem in Holland is the chief source for tulip bulbs. In the 17th century the cultivation of tulips became a mania in Holland, and enormous prices were often paid for single bulbs of some rare variety.

Tulip-Tree, the well-known *Liriodendron Tulipifera*, a member of the magnolia family, and most commonly but wrongly known

as poplar. It is one of the most magnificent forest-trees of the United States, with a noble shaft, great crown, broad and lobed leaves and tulip-like flowers. It is the source of the so-called poplar-lumber of commerce; from the color of its wood it is called whitewood; and in some localities it goes by the name of yellow poplar. The tree sometimes reaches a height of 190 feet, the ordinary height being 70 to 100 feet. It is rare in New England and west of the Mississippi River, but is found as far south as Alabama and Georgia. It grows rapidly and is hardy. Always attractive, in its time of bloom it is of much charm, bearing a wealth of erect, cup-shaped, yellow-green blossoms.

Tulloch (*tŭl'lŭk*), **John,** D.D., a Scottish theologian and author, principal of St. Andrews University, was born in Perthshire, June 1, 1823, and died at Torquay, Devon, Feb. 13, 1886. He was educated at Edinburgh and in Germany, and was one of the leaders of liberal thought in theology in his time. His writings embrace a Burnett prize-essay entitled *Theism the Witness of Reason and Nature to an All-Wise and Beneficent Creator; Leaders of the Reformation; English Puritanism and its Leaders; Rational Theology and Christian Philosophy in England in the 17th Century; The Christ of the Gospels and the Christ of Modern Criticism; Modern Theories in Philosophy and Religion; Movements in Religious Thought in Britain in the 19th Century;* volumes of sermons: and an inspiring book for young people, entitled *Beginning Life.* He visited the United States in 1874. See *Memoirs* by Mrs. Oliphant.

Tul'sa, Okla., county-seat of Tulsa County, is in a fine agricultural section, which also is a coal, oil and gas belt. Shale, fire-clay, limestone and sandstone are in the vicinity. The city has excellent public schools, with free kindergartens, a business college and the Presbyterian State University. It is a city of good homes and churches. Tulsa has an excellent sewage-system and the service of five railroads. Population 11,000.

Tum'bleweed, the popular name of various annual plants which have a bushy, branching habit and become more or less globular in outline by the curving of the branches. Being shallow-rooted, in light soil they are caught by the wind and tumbled along, sometimes being carried for many miles and scattering their seeds by the way. They belong to the prairies and great plains of this and other countries. One of the most common of the tumbleweeds has recently been imported into this country under the misleading name of Russian thistle. It is not a thistle, but a prickly member of the goosefoot family (*Salsola kali tragus*). It first appeared on the plains of Dakota, and has spread extensively.

Tu'nicates, an interesting group of marine animals, surrounded by a tunic from which their name is derived. They embrace animals called sea-squirts on account of their ejecting little jets of water from their terminal openings when irritated. They formerly were classified with worms or between the worms and the mollusks. In 1866, however, Kovalevsky, by observing their development, showed that in early stages they come near the structure of tadpole or of frog. Moreover, the steps in their development were shown to agree fully with those of the lowest recognized vertebrate, Amphioxus. The adult animals are fixed or sessile. The larvæ are free-swimming and, in some particulars, on a higher plane than the adults. They, for example, have a gristly rod or notochord in the back of the body and, above this, a nerve-cord in the same position as in vertebrated animals. They also possess gill-clefts. The notochord and dorsal nerve-cord disappear in the adult, but their presence in the larva makes it necessary to advance the tunicates into the vertebrated group, and it is now recognized that the possession of a notochord, a dorsal nerve-cord and gill-clefts marks the vertebrated animals and distinguishes them from all others. The work of Kovalevsky was epoch-making, because it broke down the supposed barrier between vertebrates and invertebrates, and opened the way for considering their affinities in an unbiased spirit. The tunicates are ovoid or barrel-shaped animals attached at one end to stones, weeds or other objects. The free end has two openings through one of which water enters and, after circulating through the gills, passes out of the other. They afford an illustration of degeneration in development. When free-swimming in their youth, they are on a higher level but soon become attached and, losing some of their organs, undergo retrograde development. See VERTEBRATES.

Tu'nis, once an independent state in what was called Barbary (*q. v.*), is a French protectorate in Africa. It is bounded on the north and east by the Mediterranean, on the south by Tripoli and the Sahara and on the west by Algeria. It is 440 miles long from north to south and 115 wide, covering 64,600 square miles, Missouri or Washington (state) being only about 5,000 miles larger, and has a population of 1,900,000 or less than that of Chicago. The coast is irregular, and there is only one river, but there are many salt-marshes. Capes Blanco and Bon on the northern coast are Africa's farthest north. The northwest is mountainous, some peaks rising 5,000 feet, the south a *steppe.* The country is fertile, the mountains being covered with great forests of oak and barley, figs, maize, olives, oranges and wheat being

produced abundantly. The olives are specially cultivated for their oil, and the wheat is exported in great quantities. Great herds of cattle graze on the plains, the horses and dromedaries are celebrated, and the sheep are famous for their wool. Copper, iron, lead, mercury, niter, phosphates, salt and silver are found, the production of phosphates being so large that a railway was built to transport it. There also are fine mineral springs and considerable fisheries. Trade is mainly with the interior, which sends gold, gums, ivory and ostrich-feathers for European countries. The people are Arabs mainly, but the population is of the most mixed character, containing traces of the ancient Numidian, Phœnician and Roman elements. There are 128,895 Europeans, Italians numbering 81,156, Frenchmen 34,610, while the native Jews total 60,000. The French army of occupancy numbers 20,362. The prevailing religion is Mohammedanism, and the revenue from Mohammedan property is applied to religious, educational and charitable purposes. The Christians include 35,000 Roman Catholics, with English and French Protestants and the native converts of their missions.

Under the Romans Tunis was about the same region as Carthage. It was conquered by the Vandals in the fifth, the Byzantines in the sixth and the Arabs in the seventh century. Louis IX of France (St. Louis) invaded it in 1270, Charles V of the Empire in 1525. Turki of Crete made himself master of the land in 1575, acknowledging, however, the suzerainty of the Turkish sultan at Constantinople. His descendants have occupied the throne since 1691, paying tribute to Turkey till 1871. Tunis was a nest of pirates down to 1816. France invaded the country in 1881, and forced the reigning prince, called a *bey*, to put himself under French protection. Government is administered by the French foreign office through a resident-general and his cabinet of nine ministers, two of these being Arabs. The governors of the 13 districts into which the land is divided are French, their subordinates Arabs. The French have suppressed the slave-trade, lifted burdensome taxes, established courts and provided municipal government for the capital. A department of arts and antiquities has been established, and a national museum formed. There are about 200 French and 1,500 Mohammedan schools, beside many private schools and a Muslim university. The French schools teach nearly 25,000 pupils. There are 704 miles of railroad, all in French hands, and $15,000,000 are being spent on building 356 miles more and on colonization. There also are 1,750 miles of good highroads, 2,250 of telegraph and 300 of telephone, and about 375 postoffices. The principal commercial ports are Tunis-Goletta, Susa and Sfax. The chief exports after wheat are barley and oats, cattle and sheep, hides, olive-oil, phosphates, zinc, lead and woolens. The main imports consist of ironwares, wheat, flour, barley, machinery, oats, sugar, coal, woolens, tobacco and coffee.

Tunis, the capital of the protectorate of Tunis, is near the mouth of the Mejirdah, about ten miles from the ruins of Carthage. It has a wall five miles around and a strong castle. The streets are narrow and dirty, and the houses of one story, with no windows on the outside. The bey's palace and some of the mosques are fine buildings, and the bazars are attractive. There are a Muslim university in the Great Mosque, a Roman Catholic cathedral, a Greek church, an Italian theater and large barracks. A national museum has been founded near Tunis, the Franco-Tunisian government having formed a department of Tunisian arts and antiquities. By means of a canal, opened in 1893, Tunis is accessible to oceanic commerce. It also has railroad connection with Algiers. The manufactures are of silk, wool, leather, soap, wax and olive-oil. Population 177,500, of whom 100,000 are Moslems and 50,000 Jews.

Tun'nel, an underground passage dug out without removing the earth above it. Tunnels are dug under bodies of water, and through mountains when the passage over or around would be less economical or less convenient. They may also be made under roads and streets for convenience of passage. The digging or boring of tunnels presents many different problems, depending on the character of the soil. In a mountainous country the operation usually involves drilling and blasting rock. Water is nearly always met with, particularly under rivers and lakes, and the methods of the pneumatic caisson have to be used. Most tunnels have to be lined with timber or masonry arches, to keep the roof and sides from caving in, and a common method is to carry forward with the digging a steel tube as lining for the excavation. The cost of tunneling has decreased greatly within a few years, owing to the introduction of special machinery for drilling and excavating. The number of large tunnels is now so great that it is impossible even to list them. The most notable ones in Europe are the Mt. Cenis, eight miles long, costing $15,000,000; the St Gothard, nine miles long, cost $12,000,000; and the Simplon tunnel, 12.3 miles long, cost $14,000,000. The Hoosac tunnel, on the railroad from Boston, Mass., to Troy, New York, is 4¾ miles long. It was 17 years in construction, and cost $11,000,000. Other notable American tunnels are the Grand Trunk railroad tunnel at Port Huron, Mich., under St. Clair River; the Chicago water-supply tunnel, four miles out under Lake Michigan;

the Sutro tunnel at the Comstock mines, Nevada. The Hudson River tunnel to connect Jersey City and New York City is now being constructed by the Pennsylvania Co. to give its road access to New York City and Long Island. The entire work of construction is nearing completion and trains will run under the river on all lines in 1909. The tube between Hoboken and Christopher Street, New York City, already is open. It is conservatively estimated that 77,000,000 passengers annually will travel through all four tubes of the Hudson tunnel system. It continues through a subway across the city and connects with one of the three tunnels under East River, a second connecting the street-car system of New York City with that of Long Island City and the third being the Brooklyn extension of the New York subway on from the Battery. (See NEW YORK CITY). The subway itself is 21 miles long, the greatest municipal undertaking of modern times, and is estimated to have cost $50,000,000. It has two tracks for expresses and two for local trains. In Chicago (*q. v.*) there is a subway with 45 miles of track in operation and 15 miles of extensions projected. It, however, is used only for freight-distribution in the business district. Among notable recent tunnels are those bored by the Southern Pacific Railroad at Santa Margarita, Cal., so as to extend their railroad along the coast from San Francisco to Los Angeles.

Tun'ny, a fish of the mackerel family, found in the Atlantic Ocean, and especially in the Mediterranean Sea. It is a very large fish, from nine to 20 feet long, sometimes weighing 1,000 pounds. It is thicker than the mackerel, dark blue, with silvery spots. The European variety is highly esteemed for food, and is caught in nets shaped like a funnel, the fish entering the wide mouth and being driven to the narrow end, where they are killed with lances and harpoons. Near Constantinople it appears in shoals so crowded that they are often taken by hand. The best tunny-fisheries are in Spain, Italy and Sardinia. The American tunny, found on the Atlantic coasts from New York to Nova Scotia, is black above and white below, and is used largely for oil, one fish sometimes yielding 20 gallons.

Tup'per, Sir **Charles,** G. C. M. G., Canadian statesman, was born at Amherst, Nova Scotia, July 2, 1821, and was educated at Edinburgh, Scotland, for the medical profession. From 1857 to 1860, having entered politics, he was a member of the executive council and provincial secretary of Nova Scotia, and from 1864 until federation he was prime minister. He was a strong advocate of Canadian federation, and in 1870 joined the Dominion cabinet, in which he held various portfolios and was one of the leaders of the Conservative party. As minister of railways and canals, he advocated the construction of the Canadian Pacific, for a time was finance-minister, was Canadian representative at the fisheries conference at Washington, D. C. (1887), and in 1896 became prime minister of the Canadian Dominion. From 1883 to 1887 he had been high commissioner for Canada in England. In the general election of 1896 his administration was defeated on the Manitoba school-bill. Mr. Tupper was knighted in 1879, created a baronet in 1888, and until recently was leader of the (Conservative) opposition in the Dominion house of commons. His son, Sir C. Hibbert Tupper, born in 1855, was minister of justice and attorney-general for Canada, 1895-6. He for a time was a member of the Canadian house of commons, representing Pictou, Nova Scotia. In 1892 he was created a K. C. M. G. for services rendered as agent of H. B. M. at the Paris Tribunal of Arbitation.

SIR C. TUPPER

Tupper, Martin Farquhar, an English author, was born at London, July 17, 1810. He was a graduate of Oxford, and was admitted to the bar. In 1838 he published *Proverbial Philosophy,* which was very popular with the people, though ridiculed by the critics, and has passed through 40 editions. His numerous works include *Crock of Gold; Hymns for All Nations; Stephen Langton;* and *Three Hundred Sonnets,* none of which at all equaled his first work in popularity. He died on Nov. 29, 1889.

Tura'nians, one of the large divisions of the human race. (Finno-Tartar and Ural-Altaic are other names for it.) It includes the Hungarians, Bulgarians, Lapps and Finns, with other tribes in Europe; the Samoyeds, living in the northern part of Asia; the Turks or Tartars, forming the largest division; the Mongols, divided into eastern Mongols and Buriats; and the Manchus, the principal race of the Tungusian branch, the present ruling people in China. Of these various tribes, those living in Europe are the most advanced in languages and customs, and those in northern Asia are the lowest of the race. The name usually given to those related tribes is taken from the Persians, who, calling their own country Iran, named the countries north of it Turan. They sometimes are called Mongolian, Scythian or Tartaric races. The Turanian languages do not present the same unmistakable family likeness as the Aryan and Semitic groups, and scholars differ in re-

gard to them, some including the Dravidian dialects of southern India and others considering the Mongol and Manchu dialects to be distinct languages. The Finnic branch of languages is superior to the others, having some national literature, as the legendary and popular songs of the Finns and Hungarians. Consult Müller's *Science of Languages* or Peile's *Philology*. See AUSTRIA-HUNGARY, FINLAND and LITERATURE.

Tur'bine, a form of steam-engine in which the rotation is produced by the impact of a jet of escaping steam on the blades of a wheel. There are two forms of the turbine in use: the Parsons and the De Laval. In the Parsons turbine the steam from the boiler strikes the blades of a series of turbines fixed on one shaft, and finally escapes into a condenser or into the atmosphere at a low pressure. In the De Laval turbine the jet of high-pressure steam strikes a series of steel-buckets on a wheel similar to a Pelton water-wheel. The speed of turbines is very high. That of a 150 H. P. Parsons turbine is 4,800 revolutions per minute, while that of a 50 H. P. De Laval machine has the enormous speed of 15,000 revolutions per minute. These very high speeds require special reducing-gearing before use for most machinery. The Parsons turbine was first successfully used directly on dynamos and also on the shafts of the propeller of an experimental steamer, the *Turbina*. This was then the fastest boat in the world, having made 34½ knots per hour. It is 100 feet long, and has three turbines of a total H. P. of 2,000. Tests of turbines have shown a remarkably low consumption of steam per H. P., that of small turbines rivaling that of the best, large, compound steam-engines. For steamships a great advantage claimed, in addition to economy, is that of the small size and weight of the turbines. Mechanically the turbine has the great advantage over the piston steam-engine in that no mechanism is needed to change a backward and forward straight-line motion into rotary motion. Much is being done to develop the turbine, but practically there are only two ways of increasing its efficiency. One is to improve the machine; the other is to improve the management of the working fluid. In general, the larger the marine turbine, the simpler the construction, the higher the steam's efficiency and the lower the rate of rotation. In 1899 turbines 35 and 50 inches in diameter were used in *The Viper*, a torpedo-boat destroyer; and though this is only 210 feet long and of 375 tons displacement, the turbines developed 11,000 horse-power and over 43 miles an hour. No vibration was produced, the engine-room being so quiet that it was difficult to realize the presence of the engines. In 1901 the turbine was applied to passenger steamships and the steamer (of 1,429 tons) averaged 18½ knots an hour. The success was so pronounced that the Cunard Company at once built The Lusitania and The Mauretania (see STEAMSHIPS) and equipped each with quadruple-screw turbines. The commercial practicability of the turbine has been demonstrated.

Tur'bot, one of the flatfishes found in almost all European seas. It ranges from the Mediterranean to the coast of Scandinavia. It is highly esteemed as food, being the best of all the flatfishes in that regard. It is a large fish, sometimes reaching a weight of 70 pounds, but that weight is very exceptional. It feeds on crabs, small fishes, sea-urchins and fish-eggs. The true turbot does not occur on the American coast. An entirely different flatfish, of smaller size, is incorrectly called turbot in the United States. See FLATFISH.

Turenne (*tū'rĕn'*), **Henri de la Tour D'Auvergne,** Viscount de, a great French soldier, was born at Sedan on Sept. 11, 1611. He was sent to Holland to study the art of war under an uncle of his, the celebrated Maurice of Nassau. He joined the French army, serving in Germany, where he relieved Mainz, besieged by the emperor's army. He then was attached to the Swedish army under Bernhard of Saxe-Weimar, where he captured several towns, and later defeated the Austrians and Spaniards at Casale and took Turin. After his conquest of Roussillon in 1642, he was made a marshal of France and given chief command on the Rhine, when he defeated the Bavarians at Rottwell, but was himself defeated at Marienthal. With Condé he avenged this defeat at Nördlingen. Turenne finished the war by conquering the electorate of Treves and (with the help of the Swedes) Bavaria, and conducted a successful campaign in Flanders. In the civil wars in France Condé and Turenne, the two greatest generals of the period, were on opposite sides, and Turenne with inferior forces was uniformly victorious, finally driving Condé from France. He then conquered much of the Spanish Netherlands. Louis XIV made him marshal-general of France, and only his Protestantism prevented his being appointed constable. Bossuet's celebrated *Exposition of Christian Doctrine* was written at the king's suggestion to effect the conversion of Turenne to Roman Catholicism, and aided by the king's solicitations was successful. In the campaign in Holland in 1672 he compelled the Elector of Brandenburg to beg for peace. His last campaign is disfigured by the devastation of the Palatinate, where he burned 30 towns. His desire to retire could not be gratified, as he was the only general that could successfully oppose Montecuculi, the great Austrian general, and for nearly half a year their strategy was the admiration of Europe. Having forced his antagonist to

a battle at Sasbach, Turenne was viewing the preparations for the attack, when he was killed by a stray ball on July 27, 1675. He was buried by order of the king at St. Denis, the place of the royal sepulchers. His monument was injured during the Revolution, but was finally placed beside that of Napoleon in the Hotel des Invalides, in Paris. See *Life* by Cockayne.

Turgenev or **Turgenieff** (*tŏŏr-gĕ'nyĕf*), **Ivan,** a Russian writer, was born at Orel on Oct. 28 (= Nov. 9), 1818. After studying at Moscow, St. Petersburg and Berlin, he obtained a position in the department of the interior at St. Petersburg. On account of his liberal ideas he was banished for a period, but was finally allowed to return to Russia. His home, however. for the most part was at Paris and at Baden. Many of his works were written in French, and have been translated into English and German. Among his best known novels are *Fathers and Sons, Liza, Smoke, Dimitri Rudin, Journal of a Useless Man* and *Virgin Soil.* He died on Sept. 3, 1883.

Tur'gor (in plants), the state of a cell when its wall is stretched by pressure of the water within it. Every active cell is normally turgid if adequately supplied with water, because the absorption of water by the protoplasm goes on until the elastic resistance of the wall balances the force (osmotic pressure) which determines the entrance of the water. The turgor varies from time to time and in different plants, but ordinarily equals three to six atmospheres, and in special conditions may rise much higher.

Turgot (*tür'gō'*), **Anne Robert Jacques,** a French statesman, was born at Paris, May 10, 1727. He was educated for the church, and was prior of the Sorbonne in 1749. In 1752 he studied law and became councilor in Parliament. He was given charge of the province of Limousin in 1761, where he introduced many reforms, as abolishing the method of mending the roads by the compulsory labor of the poor. He introduced the cultivation of the potato and other means of subsistence for the people. Under Louis XVI he was put in charge of the finances of the country, which were in a terrible state of disorder. His reforms included free trade in wheat in the interior of the kingdom, the doing away with the obligation to labor for the state and substituting a single tax on land for general taxes. He reduced the expenses of the government, and introduced exactness and faithfulness into the service. If his plans had been received with favor by the nobility and statesmen, France might have been spared the horrors of the Revolution. But the combination against him was so strong that the king yielded, and Turgot retired after 20 months of service. Among his writings are *Reflections upon the Formation and Distribution of Riches* and *Usury.* In writing on the American war, his views of the nature of colonies have since been generally adopted. His Latin inscription for the portrait of Franklin is celebrated: *Eripuit cœlo fulmen, sceptrumque tyrannis.* (He snatched the thunderbolt from heaven, and the scepter from tyrants.) Turgot died at Paris, March 20, 1781. See *Life* by Say.

Turin (*tū'rĭn*) or **Torino,** a city in northern Italy, once the capital of the kingdom, is 75 miles southwest of Milan and on the Po. It is one of the handsomest cities in Europe, famed for beautiful squares, fine bridges and pleasant promenades. Among the squares are Piazza San Carlo, with a statue of Emmanuel Philibert of Savoy; Piazza Vittorio Emmanuele, the finest square in Europe; and Piazza Castello, in which are the royal palace, with its fine library and armory, the old palace of the dukes of Savoy, the military academy and the theater. There are a fine, five-arched bridge across the Po, begun by Napoleon with money obtained from the offerings at the cathedral and finished by the kings of Sardinia, and a beautiful single-arched one over the Dora. The cathedral, built in the 7th century, is the oldest church, and that of San Filippo the handsomest. The university, founded in 1404, has 68 teachers, 2,750 students and a large library, including that of Cavour, which was bequeathed to it. The Academy of Science has the finest Egyptian museum in Europe. The manufactures are woolen and silk goods, jewelry, paper, pottery, pianos and carriages. Turin was settled by the Taurini, a Ligurian tribe. Hannibal sacked the city after crossing the Alps. In 166 B. C. it became a Roman colony, and on the fall of the empire went to the Lombards. Charlemagne made it the residence of the duke of Susa; and in 1032 it became the possession of the house of Savoy. The French held it for 60 years from 1506 and in 1640, and in 1800 it was united to the French empire. In 1815 it was restored to Savoy, and was the capital of Sardinia until 1860 and of Italy until 1865. Population 335,656.

Turkestan (*tōōr'kĕs-tăn'*), (the country of the Turks), is a country in Central Asia, lying between the Russian dominions on the north and Persia and Afghanistan on the south. It is divided into western and eastern Turkestan by the table-land of Pamir (*q. v.*), called the Roof of the World, which is about 15,000 feet high. Western Turkestan, once called Independent Tartary, consists of the great plain of the Caspian and Aral Seas and the hilly districts on its eastern border, formed by the western branches of the Hindu Kush Mountains. Eastern Turkestan, also called Chinese Tartary, includes the country east of the table-land, reaching to the desert-plains of the Gobi. The Oxus, Jaxartes and Zerafshan

flow westward from the Pamir tableland, while the Yarkand and Kashgar are the most important rivers flowing eastward. The higher mountain-districts give fine pasturage in summer for flocks, and the upper valleys and plains are fertile and highly cultivated; but toward the Aral and Caspian Seas there are large regions of sandy and trackless wastes, many of them lower than the sea, where the wells are salt and both salt and sulphur are found. The portion of eastern Turkestan near the Pamir tableland is mountainous, and the center is a great plain, with fertile belts along the streams, but most of the country is a desert, except where it is irrigated. Gold, silver, iron, copper, niter, sulphur, asbestos, agate and jasper are found; while the field-products are cotton, rice, wheat, hemp, flax, barley, corn, tobacco and most of the common fruits. The great article of export is cattle. Manufactures of silk and cotton goods, sabers and knives exist. In western Turkestan the people are Turks or Tartars and Tajiks or Aryans. They also are divided into the settled population and the nomad or wandering tribes. The religion is Mohammedanism. The people are jealous of foreigners, so that the country has been very difficult of access by Europeans. The inhabitants of eastern Turkestan are varied, the Turanian element being the most prominent. The villages are a collection of walled inclosures, surrounding houses and gardens.

Turkestan has had an important part in Asiatic history. Most of the western part belonged to the Persian empire, and many of its large cities were built by the Persians. It went with Persia into the hands of the Macedonians, part of it becoming a Greek province. In the 8th century the Arabs had possession, and it was finally overrun by the Mongol hordes of Genghis Khan (*q. v.*). Under Timur (*q. v.*) it was the center of a great empire, stretching from Moscow to the Ganges and from the Hellespont to China; its cities were adorned by the spoils of victory; and colonies of learned men and skilled artisans were brought to the country. The empire split into fragments on the death of Timur's youngest son, and various independent states were formed out of what now is Turkestan. In 1792 the present Uzbeg dynasty obtained the throne. The later history of Turkestan is a series of wars between Bokhara, Khiva and Khokan; of raids of the Turkomans along the Persian border; and of the progress of Russian conquest from the north and west. The Pamir tableland separates the acquisitions of Russia and England in Asia, and both countries have been contending for Turkestan, but so far Russia has succeeded in obtaining control of the larger part of the country, thus forming the Russian general government and provinces of Turkestan, with an area of 400,770 square miles and a population of 5,746,600. Its capital is Tashkend (*q. v.*). Chinese or Eastern Turkestan belongs administratively to Sin-Kiang, the area being 550,340 square miles and the population 1,200,000.

Tur'key, a large bird related to the pheasants and originally inhabiting the New World. There are three species known: the North American, the Mexican and the Central American bird. The Mexican turkey was domesticated by the Indians before the discovery of Mexico by the European, and is the original from which the domesticated birds are descended. It was introduced into France and England in the 16th century, and is imported all over the world. The turkey of Central America excels all others in variety and splendor of plumage, which combines metallic green, blue, black, yellow and red. It lives in the open forest and the open country, rather than in the deep forests, like the wild turkey of North America. The male has no tuft on the neck. The common wild turkey of North America ranges from southern Canada to Florida and Mexico, but has been so persistently hunted that it is found only in remote swamp and woodland or mountain region far from haunts of man. It is about four feet long, being the largest game-bird; has plumage of a metallic bronze; the bill and head are red, the head and neck bare; from the center of the breast of the male hangs a beard-like tuft. The hen is a devoted mother, but her young have a serious struggle for existence, snakes, hawks and other enemies disturbing and destroying them.

Turkey-Buzzard, a bird belonging to the group of the New-World vultures. It abounds in the warmer parts of North and South America, and ranges throughout the United States, except in New England. This bird is about 27 to 30 inches long. It has a dark plumage, with a violet and greenish luster on the upper parts. The bill is white, and the head and upper parts of the neck, which are destitute of feathers, are reddish. It feeds on carrion. See BUZZARD and VULTURE.

Turkey or **The Ot'toman Empire** consists of those countries in Europe, Asia and Africa under the control of the sultan, though it is usually limited to Turkey in Europe and Turkey in Asia, called Turkey proper. Including all subject states, it covers 1,622,900 square miles and has a population of 41,049,720. Turkey in Europe has been reduced to a territory stretching from the Black Sea to the Adriatic, from the Ægean Sea and Greece on the south to the Balkan Mountains and north of them to about 43° north latitude, covering 65,350 square miles, with a population of 6,130,200, made up mainly of Turks, Greeks, Bulgarians and Albanians. Turkey in Asia covers 693,610

square miles, with a population of 17,683,500, consisting of some 4,000,000 Arabs, besides Turks, Greeks, Kurds, Circassians, Armenians and Jews. It stretches from the Black Sea to Arabia and the Mediterranean and from the Ægean to Persia. A part of Arabia, Samos, Tripoli (including Benghazi) and Egypt are Turkish dependencies.

Surface. Turkey proper has a great extent of coast, broken by bays, gulfs and islands, with many fine harbors. The Dead Sea in Palestine and Lake Van in Armenia are among its many large salt-lakes. The Balkan Mountains, the Taurus and Anti-Taurus ranges and the Syrian mountains are among its principal ranges, while a large part of European Turkey is mountainous, and in Asiatic Turkey elevated plains abound.

Climate. The winters are cold in the mountainous districts, but warm in the sheltered valleys, and the summers very hot, especially in Syria and Asia Minor. Very little rain falls from April to September, and many plains need irrigation to be cultivated. The highest peaks reach the region of perpetual snow.

Resources. The minerals are copper, lead, alum, silver, emery, niter, iron and coal, though many of the mineral resources are still undeveloped. In European Turkey the rose is extensively cultivated, and the attar is an article of commerce. The trees of Asiatic Turkey — the cedar, cyprus, sycamore, mulberry, olive, fig, citron, orange and pomegranate — differ from the fir, pine, almond, walnut, chestnut, peach and plum-trees most abundant in European Turkey. There are 250 species of birds and many wild animals. It is a rich country with great resources, but still undeveloped.

Government and Religion. The religion of Turkey is Islam, and the Koran is the law. The sultan or head of the government is looked upon as the successor of Mahomet; and his will is absolute, so far as it is not in opposition to the Koran or to the Multeka, the writings of Mahomet and his immediate successors. There are 2,120 mosques in the empire, of which 379 are in Constantinople alone. Four wives are allowed by the Koran, but most of the people are too poor to support more than one. The Christians of Turkey, found in the Greek, Armenian, Protestant and Roman churches, and the Jews are all tolerated as independent sects by the government, though often bitterly opposed to each other. Turkey is governed by the sultan, with two chief officers appointed by him, the grand vizier, the head of temporal affairs, and the Sheik-ul-Islam, the head of the church. There is a council, which corresponds to the British cabinet. The divisions of the country are called *vilayets* (governments), *sanjaks* (provinces) and *kazas* (districts). The present sultan is Abdul-Hamid II of the house of Othman, the twenty-eighth sultan since the conquest of Constantinople (1453). All children born in the royal harem are considered heirs to the throne, whether the children of free women or of slaves, and the crown passes to the male descendants of Othman according to age. The standing army numbers 350,000 men, and military service is required of all able-bodied Mohammedans, while all others pay an exemption-tax. The navy has about 50 vessels, including 18 iron-clad ships of inferior class.

Education. The Koran and the Multeka encourage public education, so that public schools have long been established in most of the prominent towns, while colleges with public libraries are attached to the principal mosques. At Constantinople are the Great National school (Greek), founded in 1870, a university founded in 1900, an imperial art-school, law, military and engineering schools and a naval school on an island in the Sea of Marmora. The Christian communities have good institutions, among them Robert College at Constantinople and the Syrian Protestant College at Beirut.

History. The Ottoman empire is the successor of the Byzantine empire (*q. v.*), and was founded by Othman or Osman who conquered Nicæa and other districts, and succeeded to the power of the Seljuk sultans. Adrianople was taken in 1361 by his grandson. Mohammed II (*q. v.*) after a siege of 53 days took Constantinople and ended the Byzantine kingdom on May 29, 1453. Solyman the Magnificent (*q. v.*) continued the conquests of his predecessors and brought Turkey to its highest military power. During his son's reign the Turks lost the battle of Lepanto. Under his successors the Turkish power was reduced by such generals as Montecuculi, Sobieski and Prince Eugene. (See JOHN II OF POLAND and EUGENE). The loss of the Crimea and the regions north of the Black Sea, the conquest of Egypt by Bonaparte and its resulting war with France increased the troubles of the country. The revolt of the janizaries ended with a terrible struggle and massacre in 1826. At Navarino, Oct. 20, 1827, the Turkish fleet was destroyed, and in 1829 Greece became independent. Between 1840 and 1867, exclusive, Egypt (*q. v.*) became practically independent. In 1840 Turkey was admitted into the political system of European states, and since that time her power has been strengthened by the alliance of other nations, as by England, France and Sardinia in 1854 in the Crimean War against Russia and by the French and English in the conflicts between the Druses and Maronites at Damascus and in the Lebanon (*q. v.*). In 1875 Bosnia (*q. v.*) and Herzegovina revolted against Turkish misrule, and a year later there were uprisings in Bulgaria (*q. v.*),

followed by horrible massacres of men, women and children by Turkish soldiers. These atrocities aroused all Europe. On account of them England could not now befriend Turkey, and Russia, having secured the neutrality of Austria by giving her permission to occupy Bosnia and Herzegovina on certain conditions, declared war against Turkey in 1877. After a bloody contest Plevna, the Turkish stronghold, fell, and the Russo-Turkish War was ended by the peace of 1878. This changed the map of European Turkey greatly, Rumania, Montenegro and Servia becoming independent. Bulgaria north of the Balkans was erected into a principality under Turkish protection. Southern Bulgaria, called East Rumelia, was left to Turkey, but in 1885 it was united to northern Bulgaria, while Bosnia and Herzegovina came under Austrian control. A portion of Armenia, including Batum, was taken by Russia. Beginning with 1895, the Armenians were subjected to the most terrible oppression by their Turkish masters, who feared an uprising to revive the ancient Armenian monarchy and were also determined to crush the Armenian faith. These oppressive measures were resisted by their victims, who were at once punished by torture and death. In 1895 and 1896 systematic massacres of the Armenians were carried out by the Turks, in which over 2,500 villages were obliterated, about 21,000 people murdered, and thousands left starving and shelterless. It is believed that the sultan had tacitly consented to the extermination of his Armenian subjects, which would doubtless have followed, save for the warning interposition of the European powers, compelled by the outraged public opinion of Christendom. In 1896–7 Crete (*q. v.*) revolted, Greece attacking Turkey but being defeated, and Crete gained self-government, though under Turkish control. Macedonia revolted in 1903, but was unsuccessful in securing the sorely needed reforms. On July 24, 1908, the sultan was forced by Turkish reformers and by the revolt of the army to restore the constitution that had been granted in 1876, but revoked, and to order the assembling of a chamber of deputies. In October of the same year Austria annexed Bosnia and Herzegovina, Bulgaria proclaimed absolute independence, and Crete demanded to be incorporated politically with Greece.

The chief towns are Constantinople (1,106,000), Salonica (150,000), Adrianople (81,000), Smyrna (201,000), Baghdad (145,000) and Damascus (250,000). Consult Creasy's *History of the Ottoman Turks* and Farley's *Modern Turkey*.

Turks, a race of people belonging to the Turanian family, who appeared first in Asia among the Tartar tribes. In the 6th century around Turkestan grew up a Turkish empire, which was overthrown by another Turkish tribe, the Uigurs, the first Turks to possess a written language. They were driven westward by the Chinese, with whom they had been contending for centuries, and their kingdom in Central Asia was entirely overthrown by Genghis Khan (*q. v.*). But they had already established themselves in the west of Asia, where the possessions of the Seljuks, another tribe of Turks, reached from Persia to India between the 10th and 12th centuries. The Ottoman empire was founded in the 14th century by Othman, and the present inhabiants of Turkey are called Osmanli or Ottoman Turks. The Turkomans ("like the Turks") are the descendants of the old Seljuks, and are found in Turkestan. The Ottoman Turks, found in the Turkish empire, are more like Europeans than the other Turkish tribes, which have the broad face, high cheekbones and yellow skin of the Mongolians. The different tribes speak nearly the same language, and usually are Mohammedans, though the Turks on the borders of China are Buddhists, and those of Siberia, Greek Christians. See SELJUKS and TURANIANS.

Turks and Cai'cos Islands, two groups of British islands, over 30 in all, southeast of the Bahamas and under the government of Jamaica. The largest, Grand Caicos, covers 112 square miles; and Grand Turk, 14 miles square, is the seat of government, in telegraphic communication with Jamaica and Bermuda, and has 1,883 inhabitants. The only important industry is salt-raking, about 1,800,000 bushels being exported annually. Sponge and fibre industries are also carried on. Population 5,287.

Tur'meric, a name given to the roots of a plant of the ginger family. The roots or root-stocks are yellow, marked with wrinkles, and a darker yellow or reddish brown inside, and when chewed make a yellow stain; they smell like ginger, and have a somewhat similar taste. They are used somewhat in dyeing, in coloring varnishes and in curry-powder and pickles. Paper colored by turmeric is extensively used by chemists as a test for alkalies and for boric acid.

Turn'er, Rt. Hon. Sir **George,** P. C., G. C. M. G., formerly premier and treasurer of Victoria and treasurer in the Barton (Australian commonwealth) cabinet, was born at Melbourne, Victoria, in 1851, and educated at Melbourne University. In 1887 he entered politics. He has held office in a number of administrations, including the ministership of customs, of defense and of health, and has been solicitor-general. He has been a member of the Australian National Federation Convention and chairman and president of the Federal Council.

Turner, Joseph Mallord William, an English painter, was born at London on April 23, 1775. His first art-work was

coloring prints for an engraver. He was indebted to a Dr. Monro for encouragement in his early work by giving him the opportunity to see his fine collection of water-colors and by buying his sketches. He studied at the Royal Academy, where he exhibited his pictures, and in 1802 was elected a member, being already recognized as the first landscape-painter of his time. His style was afterward changed by travel in Europe, and in the last few years of his life, as some physicians believe, by a change in his eyes, which cast the blue mist so characteristic of his later works. He contributed 259 pictures to the Royal Academy, and over 19,000 drawings and sketches were mounted and arranged by Ruskin. His illustrations of the poems of Rogers, Byron, Scott and other authors are well-known. Among his paintings are *Dutch Boats in a Gale, Falls of the Clyde, Sun Rising through a Mist, Building of Carthage, Bay of Baia* and *Childe Harold or Modern Italy.* His most famous drawings are *Rivers of France, Rivers of England, Scenery of the Southern Coast* etc. They were carefully prepared by him for engraving, and all his pictures were engraved during his lifetime. Ruskin in *Modern Painters* did much to raise Turner to the high position he holds among English painters. He was very eccentric, traveling alone and hiding himself for months under an assumed name, and had a strong passion for money. He died on Dec. 19, 1851, at Chelsea, leaving to the nation his collection of pictures, which have been placed in the National Gallery of London. His large fortune was left to found a home for needy artists, but some defect in the will prevented the carrying out of his wishes. He was buried beside Sir Joshua Reynolds in St. Paul's. See *Life* by Thornbury; *Life* by Hamerton; and *Modern Painters* by Ruskin.

Turner, Sharon, an English historian, was born at London, Sept. 24, 1768. He was attorney by profession, but continued his literary studies, and published a *History of the Anglo-Saxons,* in three volumes. This work was the result of years of patient collection of materials and research, and gave its author a permanent place in English literature. His other works are a *History of England from the Earliest Period to the Death of Elizabeth* and a *Sacred History of the World as Displayed in the Creation.* He died at London, Feb. 13, 1847.

Turn-Verein (*tŏŏrn-fĕr-īnĕ'*), from the German *turn* meaning gymnastics and *verein* meaning society, is a German society for gymnastic exercises, instituted in 1811 by Friedrich Ludwig Jahn, known as *Turnvater Jahn.* Jahn realized the important influence of gymnastics upon health and physical fitness, especially in the training of soldiers; and, being a soldier himself and inordinately fired with the spirit of war and patriotism, he conceived the idea of forming a society which should prepare German youth physically for excellent citizenship. In 1811 a sand-field was secured near Berlin, the edge of what now is the great exercising-ground of the Berlin garrison. Here began the gymnastic exercises which now form part of the curriculum in every German school. A monument of Jahn has been erected here, the stones of which were sent from far-away countries. Knowing the German fondness for song, Jahn sought to establish an intimate relation between singing in unison and outdoor exercises. Singing was then made a part of the gymnastic exercises on the march to and from the field, and Jahn took great pains to select patriotic and military songs. On this gymnastic field he was training the minute-men of the German Revolution. The *turn-verein* now is a great factor in German education. A university union was founded in Berlin in 1860; and was immediately imitated by other universities. An association of such unions was founded in 1872. The two great associations of *turn-vereine* in Germany include respectively 26 universities (the older including Berlin, Leipzig and Gratz), and 16 universities and high schools (including Jena, Freiburg, München and Aachen.)

Tur'pentine, a gum or resin which is found in various species of pine, and some other trees. American or common turpentine is obtained from the long-leaved pine, and is brought in the largest quantities from North Carolina. Venice turpentine, which is considered the best kind, is from the larch-tree. German turpentine comes from the Scotch fir, Strassburg turpentine from the silver fir and Canada turpentine from the balsam or balm-of-Gilead fir. Turpentine is obtained by making a cut in the tree and catching the sap, which looks much like honey. The oil of turpentine is made from this sap by distilling, and the hard part that is left is the common yellow resin, used in making soap etc. Turpentine hardens in the air, burns easily, and can be dissolved by alcohol or ether. The oil of turpentine is used in medicine and in making varnishes and paints. The name comes from the terebinth tree, from which the Greeks obtained it. See RESIN.

Turquoise (*tur-koiz'*), one of the precious stones, is a mineral, found mostly in Persia. It is a phosphate of alumina colored by copper. It is hard and of a greenish-blue color, the finest blue being the most valuable. It is used in the east for ornamenting swords, charms and girdles, and is thought to protect its owner against disease. The finest specimens are supposed to belong to the shah of Persia, as only inferior varieties are allowed to be sent out of the kingdom.

Tur'tle, a general name for all reptiles having the body inclosed between an upper shield (*carapax*) and a lower shield (*plastron*).

GREEN TURTLE ON WHARF AT KEY WEST

Names like tortoise and terrapin apply to particular kinds of turtles, but the general name embraces the green turtle, famous for making soups, the loggerhead turtle, soft-shelled turtle, snapping-turtle, pond-turtle, terrapin, tortoise and others. They inhabit both fresh and salt water, and some forms are terrestrial. Many kinds are sought for food.

Unlike tortoises and terrapins which have feet adapted for walking on land, the true turtles or sea-turtles have their limbs in the form of flippers or paddles, suited to their aquatic life and enabling them to swim with great swiftness. Their bodies also are so depressed or flattened as to facilitate their progress through the water. The head is so placed upon the neck as to permit the nostrils to be raised above the surface of the water for breathing, and the nostrils can be closed by a fleshy valve. The turtles live in the sea and come to the shore only for breeding. Their eggs are soft, differing in this respect from those of the tortoise and terrapin. The best known species is the green turtle, famous as the source of the turtle-soup so widely prized. It is a vegetarian, feeding upon seaweed. It reaches a length of 42 inches and its shell is olive or brown with yellowish spots. The hawksbill-turtle feeds upon animal substances and is not itself used for food, but is prized for the mottled shields of its shell which furnish the tortoise-shell of commerce. The loggerhead-turtle is known by its enormous head and hooked beak. It is the largest species, and readily crushes a conch-shell in its strong beak.

Turtles never leave the sea except to lay eggs. They scramble along clumsily, and if turned on their backs they are helpless. Turtles generally come ashore on moonlight nights and often utter a loud hissing noise. Audubon writes that when the female turtle is once landed she "proceeds to form a hole in the sand by removing it from under her body with her hind flippers. The hole is dug to the depth of 18 inches or two feet. The eggs are then dropped one by one and disposed in regular layers to the number of 150 or sometimes nearly 200. She now scratches back the loose sand and so levels and smoothes the surface that few persons on seeing the spot could imagine that anything had been done to it. This accomplished to her mind, she retreats to the water with all possible dispatch, leaving the hatching of the eggs to the heat of the sand." The eggs of turtles are prized as food. Large numbers of turtles are caught by turning them on their backs when on land. Sometimes they are harpooned; sometimes they are pursued in shallow water by men in canoe or boat, and when overtaken, a man springs upon the turtle's back and clings to it until it is tired out and secured.

Turtledove, an Old-World dove represented by 25 or 30 species. The common turtledove, so abundant in Europe, is both wild and tamed. It is noted for its affectionate and peaceful disposition. It is a migratory pigeon of moderate size. Like other members of the group, it feeds on seeds and various kinds of grain and makes a platform of twigs as a nest. The mourning dove of the United States is also called the turtledove. It belongs, however, to a different genus from the European dove. It is about 13 inches long, including its long tail. It is brownish olive, glossed with blue and wine colors. The plumage shows metallic reflections. It feeds upon the ground. This bird is widely known, on account of its long mournful note, even to those who have not seen it. See Dove and Pigeon.

Tuscaloo'sa, Ala., county-seat of Tuscaloosa County, is on Black Warrior River, 90 miles northwest of Montgomery. The insane asylum, with fine buildings and grounds, a college for women and the state university are situated here. The university's endowment includes 500 acres and $300,000 from lands granted by Congress. The buildings were burned in 1865 by the Federal troops, but there are four new buildings, with Clark Hall, containing the library. Tuscaloosa is in the cotton-planting and the mineral region of Alabama, which makes it the center of a large trade. It has flour-mills, cotton, shoe and leather factories. The name comes from the Indian chief, Tuscaloosa (Black Warrior), who fought with De Soto. Population 5,094.

Tus'cany, a division of central Italy, formerly a grand-duchy. It lies south and west of the Apennines, on the Mediterranean, covering 9,304 square miles. The northern part is mountainous, the remainder hilly and undulating, except the coasts, which are flat and marshy. The principal rivers are the Arno, Cecina and Ambrone, which flow into the Mediterranean. The main crops are corn, wheat, rye and barley; cattle, sheep and mules are raised in great numbers; olive-oil, wine, woolen, silk and straw-goods are manufactured. Leghorn is the principal seaport, and Florence (*q. v.*), the chief city, for centuries was the center of Italian literature and art, and is famous for the beauty of its situation and environs and for its fine art-collections. Tuscany was a part of ancient Etruria (*q. v.*). With the fall of the Roman empire it went to the Lombards, and was governed by counts, under Charlemagne and other emperors, until the latter part of the 12th century. Florence, Pisa, Siena and Lucca were the principal of the little states into which Tuscany was divided during the struggles of the next centuries. Modern Tuscany was formed in 1569, when Cosimo de Medici became grand-duke of Tuscany. Napoleon formed the kingdom of Etruria in 1801, and in 1808 made his

sister, Elisa, grand-duchess of Tuscany. In 1860 it became a part of the kingdom of Italy. Population 2,651,468. See *Tuscany* by Mrs. Trollope.

Tus'caro'ras, a tribe of American Indians, one of the Six Nations of the Iroquois family, found in North Carolina at its settlement. After difficulties with the whites, in which many of the Indians were killed or taken prisoners, a part of the tribe fled to New York, where they settled on Lake Oneida, and still have a reservation in that state. In 1829 North Carolina bought the lands still held in that state by the Tuscaroras. The name means a shirt-wearer.

Tweed, the most famous river in Scotland, rises in Peebleshire, flows for about 20 miles northeast and then in an easterly direction, emptying into the North Sea at Berwick in England. It is 95 miles long, but navigable only a few miles from its mouth. It owes its fame to beautiful scenery and historical associations. Crossing the heart of the Borders between England and Scotland, it has been the scene of many a deadly struggle, and its name is frequent in ballad and story.

Tweed, William Marcy, an American politician, was born at New York, April 3, 1823. He held the different offices of alderman, congressman, supervisor of the city of New York, school and street commissioner and state senator. While commissioner of public works in 1870, he and his followers, constituting the famous Tweed Ring, used large amounts of public funds for their own purposes. After several trials Tweed was convicted of fraud and sentenced to 12 years' imprisonment and the payment of $12,550 as a fine. He was confined at Blackwell's Island, but his imprisonment was declared illegal by the court of appeals. Several other suits had been brought against him, and he was again imprisoned for want of the $3,000,000 of bail required. He escaped to Spain, but was recaptured, and died in jail in New York City on April 12, 1878.

Twee'die, Hon. L. J., was born at Chatham, New Brunswick, in 1849. Called to the bar in 1871 and elected to the legislature in 1874, he was surveyor-general in 1890, and became provincial secretary in the Mitchell administration and in the Emerson government. He became premier and provincial secretary in 1900, and was appointed lieutenant-governor of New Brunswick in 1907.

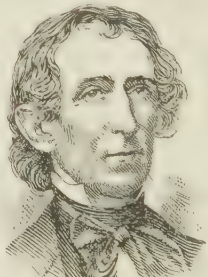
Twickenham (*twik'en-am*), a village in Middlesex, England, on the Thames opposite Richmond. It is known as the residence of Pope, whose grotto is still to be seen and whose monument is in the parish church. Strawberry Hill, famous as the home of Walpole, is near by, and the Orleans house, used by Louis Philippe while in England and still belonging to his family, is in the town. Population 20,991.

Twi'light is the faint light before sunrise and after sunset, which is produced by the reflection by the atmosphere of the sun's rays when it is still below the horizon. If we had no atmosphere, we should have no light until the exact moment when the sun would rise and no light after the sun had set. The sun must be approximately 18° below the horizon at any place before the twilight will entirely cease; so in the polar region where the sun is nearer the horizon than 18° there will be twilight all night, or rather there will be no complete night. Just what there is in the earth's atmosphere that reflects the sunlight is yet unknown. It may be dust-particles; it may be minute crystals of ice; it may be pure air itself.

Twi'ner, a plant which climbs by coiling its body in an ascending spiral about a support, as the morning-glory or the hop-vine. In their younger parts twiners are sensitive to contact, so that when they touch a support they curve sharply about it. The twining habit, like the climbing habit in general, is most extensively developed in the tropics. See CLIMBING-PLANTS.

Ty'ler, Tex., a town, the seat of Smith County, on the International and Great Northern and St. Louis Southwestern railways, about 100 miles east-southeast of Dallas. Its institutions include Tyler College, Texas College (for colored youth), a public library, a conservatory of music, the Federal court, postoffice, court of criminal-appeals buildings and a railroad hospital. It also has two public parks (Lakewood and Bellevue). Its trade consists in the shipment of live stock, cotton, hay and varied kinds of fruit and vegetables. It has cotton-gins, brick-kilns, a pottery, cotton-seed-oil mills, a fruit-and-vegetable and a box-and-crate factory. The town was settled in 1846, incorporated the same year, and received its present charter in 1875. Population 8,765.

Tyler, John, tenth president of the United States, was born at Greenway, Charles City County, Va., March 29, 1790. He graduated at William and Mary College in 1807, studied law, and had a large practice soon after he was admitted to the bar. He was elected five times to the state legislature and three times to Congress. He sympathized with the states' rights party, and opposed the United States bank, protection and all limitations of slavery. In 1825 he was chosen governor of Virginia, and in 1827 he became United States senator and was again elected in 1833. From this time he acted with the Whig party,



JOHN TYLER

being an active partisan of Henry Clay, and in 1840 was by that party elected vice-president of the United States, with General Harrison as president. The death of President Harrison, a month after his inauguration, made Tyler president in 1841. His administration, at first favorable to the Whigs, was soon displeasing to them. He vetoed the bill for a United States Bank, at that time a favorite project of the party. Several members of the cabinet resigned, and finally John C. Calhoun, the great Democratic statesman, was made secretary of state. The annexation of Texas in 1845 and the passing of a protective tariff law in 1842 were among the important acts of Tyler's administration. In 1861 he was president of the peace convention which met at Washington to effect a compromise between the north and the south. He afterwards joined the Confederate cause, and was a member of the Confederate Congress at his death, which occurred at Richmond, Va., Jan. 17, 1862.

Tyler, Moses Coit, an American *littèrateur* and professor of American history at Cornell University since 1881, was born at Griswold, Conn., Aug. 2, 1835, and graduated at Yale in 1853. From 1867 to 1881 he was professor of English at the University of Michigan, and for a time was literary editor of *The Christian Union.* In 1881 he accepted the chair of American history at Cornell. He wrote a *Manual of English Literature,* a *History of American Literature during the Colonial Period (1606-1765), The Literary History of the American Revolution, Glimpses of England* and a *Life of Patrick Henry.* His works possess literary charm as well as thorough scholarship. He died on Dec. 28, 1900.

Tyler, William Seymour, an American scholar, was born at Hartford, Penn., Sept. 2, 1810. The gift of a Greek grammar by a young minister started the boy on his career as a scholar and teacher. He graduated at Amherst College, and studied theology, but accepted the professorship of Latin and Greek in Amherst College in 1836. Besides his work in the college for more than 50 years, where he became celebrated as a teacher of languages, he is well-known from his editions of Greek authors, as *The Germania and Agricola* of Tacitus, Plato's *Apology* and *Crito* and Demosthenes' *De Corona;* and from *The Theology of the Greek Poets* and *The History of Amherst College.*

Tylor, Edward B., D. C. L., a distinguished English scholar, and professor of anthropology at the University of Oxford, was born at London, Oct. 2, 1832, and educated at the Friends' School, Grove House, Twickenham. In 1856 he took a scientific journey through Mexico, and has written *Anahuac, Mexico and the Mexicans; Researches into the Early History of Mankind; Primitive Culture;* and *Anthropology.*

Tyndale, William. See TINDALE, WILLIAM.

Tyn'dall, John, an eminent British scientist, was born at Leighlin Bridge, Carlow, Ireland, Aug. 21, 1820; and died in Surrey, England, Dec. 4, 1893. He was educated in the public schools until 19, when he entered the employ of the ordnance survey. After a short teaching experience he went to the University of Marburg in 1848, where he spent two years and took his doctor's degree. In 1851 he went to Berlin, where he made the valuable acquaintance of Magnus, Clausius, Wiedemann and others. Returning to London in 1852, he was elected fellow of the Royal Society, and in the year following was appointed professor of natural philosophy in the Royal Institution, succeeding Faraday, a position which he held until 1887, when he was succeeded by Lord Rayleigh. Tyndall's earliest investigations were made at Marburg on *The Magneto-Optic Properties of Crystals.* In 1859 he began an important study of *Radiant Heat,* resulting in a classical volume in 1872. His investigations of glacier motion were reported to the Royal Society in 1856, and later recorded in interesting popular volumes. As a skillful and brilliant lecturer on science he has, perhaps, never been surpassed. Every one should read his *Heat as a Mode of Motion* and his *Forms of Water.*

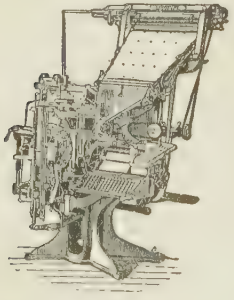
PROFESSOR TYNDALL

Tyng, Stephen Higginson, an American clergyman, was born at Newburyport, Mass., March 1, 1800. He was a graduate of Harvard College and a prominent clergyman of the Episcopal church, successively occupying parishes at Georgetown, D. C., Philadelphia and New York City. Besides his great influence in the pulpit and in church work, he was editor for some time of the *Episcopal Recorder* and *Protestant Churchman,* and wrote *Lectures on the Law and the Gospel; Christ Is All; The Captive Orphan; Esther, Queen of Persia; The Prayer-Book Illustrated by the Bible; Forty Years' Experience in Sunday-Schools;* and *The Feast Enjoyed.* He died on Sept. 4, 1885.

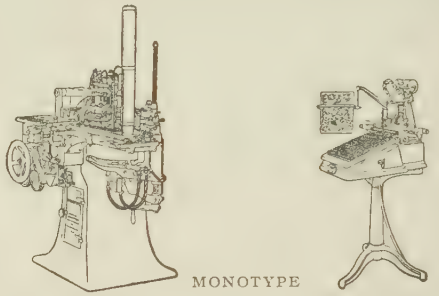
Type, the name of the metal letters used in printing. They are usually made of an alloy called type-metal, made of lead, antimony and tin, copper sometimes being added. The antimony gives hardness and the tin toughness to the soft lead, which is the principal metal used. A copper-face is sometimes put on the type by the electrotype battery, which makes it last longer. Types were formerly made by hand, but now type-casting machines do the work.

The types must be made with absolute accuracy in order to fit so exactly when placed together that they will form a solid body. To do this they are made in molds, into which the hot metal is injected. The letter to be made is cut on the end of a bar of soft steel, and then pressed into a piece of copper by the blow of a hammer, and the copper impression is fitted into the end of the mold and the metal poured in it, filling up the impression of the letter and the rest of the mold. Types are all of the same height, but of different widths according to the letter. A full set of types is called a font or fount, and has the letters in different proportions, as 60 of e, 45 of t and 40 of a, i, o, u etc. Large and small capitals, large and small italics, small letters, figures and punctuation-marks are found in a font. Types are of different sizes, called by printers nonpareil or six-point, minion or seven-point, brevier or eight-point, bourgeois or nine-point, long primer or ten-point, pica or twelve-point etc. Some of the names came from the first maker of the type, and others from the first book printed with that particular kind of type, as brevier from breviary and pica from the service of the mass called pica or pic. According to an inscription on a tablet to his memory in Mainz, Gutenberg is credited with making the first printing-letters in brass, in place of the wooden types first used in printing. The first type-founder in America was Christopher Saur, who cast the type used by him in printing a German Bible about 1735. A page of a daily newspaper will sometimes require 150,000 types.

Type'setting-Machines. The closing years of the last century contributed much to the development and advancement of the art of printing. To substitute machines for the slow, laborious and expensive process of typesetting by hand had been the aim and ambition of a number of inventors. The United States patent-office alone has recorded upwards of 500 patents for typesetting and distributing machines with improvements; but the majority of these inventions have been noted more for their ingenuity than their practical use. Nearly all of the typesetting-machines were invented with the object of using the regular hand-type. A few machines of this class are still in use in America and England. Two of the most successful machines are the linotype and the monotype, both machines making their own type. The linotype (*q.v.*) was constructed by Otto Mergenthaler of Baltimore, Md., and is largely used by the daily newspapers throughout the world. This machine casts a solid line of type (*q. v.*) from a group of matrices or molds that bear the impress of the letters. These are dislodged from their respective channel receptacles at the top of the machine and assembled by the operator in the form of words spaced out to the desired length of line; the operator simply fingering a keyboard, somewhat as in the typewriter. The monotype



LINOTYPE



CASTER AND KEYBOARD MONOTYPE

was invented by Albert Lanston of Washington, D. C. This machine casts each type and space separately, but in lines of words spaced out to the length of line desired. This is accomplished by a machine called the caster, the mechanism of which is regulated by a long strip of paper previously perforated by the operator on the keyboard. The production of the monotype being movable types, the machine is largely used in book-work and job-work, as the matter is practically the same as type set by hand and can be manipulated as such. The linotype and monotype machines have been improved so greatly in recent years that any kind of printed matter can be handled by them as well as or better than by hand; certainly much more rapidly.

In combination with the improvements and inventions in other branches of the printing-trade, as printing-presses, folding-machines and bookbinding-machinery, the use of typesetting-machines has enabled the manufacturer to reduce the price of all classes of printed books and magazines, thus bringing literature of every description within the reach of all.

Perhaps there is no trade or profession that is a better example of the vast advantages accruing to mankind from the usefulness and utility of labor-saving machinery and new inventions. Instead of displacing the workmen, the tendency in the printing-trade has been to increase the number with every new device invented. To-day there are more men and women employed in the manufacture of printed matter than ever before, irrespective of the great number employed in making machinery for their use.

W. H. AITKEN.

Type'writers, machines for writing by movable types instead of the pen. In 1714

a patent was granted in England for a writing-machine, and one was invented in France about 1784. The first writing-machine patented in America was the Thurber in 1843, which worked too slowly to be of general use. Other machines followed, each introducing improvements and new principles, until in 1873 the Remington was put into practical use. It was the result of experiments made by two printers, Sholes and Souli, whose attention was called to an article in *The Scientific American* describing a writing-machine which had been invented by John Pratt of Alabama. The first machine was finished in 1867, and was used for letter-writing. One of these letters brought the new enterprise a friend, Mr. Densmore of Pennsylvania, who joined with Sholes in perfecting the machine, until in 1873 it passed into the hands of the firm of Remington and Sons, Ilion, N. Y. It was first used by professional men. Its great advantages for business houses were not thought of until 1882, since which time it has been almost universally adopted, and many different kinds have been introduced. The types are placed on arms or bars of steel, each marked with a letter, which are moved by the fingers of the operator as are the notes of a piano. The paper is carried through by rollers, and moved one space with each impression of a letter. The use of the typewriter instead of the pen is estimated to save 40 minutes an hour or over five hours in a day. It will write 13 *letters* a second, some operators writing more than a hundred *words* a minute. Typewriting has become a profession, and there are free classes of instruction in many public institutions in the United States.

Typhoon. See STORMS.

Tyre (*tīr*), a city of ancient Phœnicia, on the Mediterranean. There were two towns of Tyre, one on the mainland of modern Syria and the other on an island opposite. It was in a fertile region, with magnificent scenery, and was a rich city in the days of Solomon, when Hiram, its king, furnished him with cedar-trees, fir-trees and gold. It was a naval city at that time also, as it is recorded that Hiram sent to Solomon "shipmen that had knowledge of the sea," and its harbors were among the finest of the period. Carthage (*q. v.*) was founded by the people of Tyre about 813 B. C., the new colony seeming to have so weakened the old city that it disappeared from history until Shalmaneser (or Sargon according to some writers), king of Assyria, conquered it after a long siege, and Nebuchadrezzar after a 13 years' siege by water and by land reduced it only to partial submission, leaving its ruler on the throne and its wealth untouched. The city fell before Alexander the Great in 332 B. C., who put in a new colony, under whom the city soon regained its prosperity. When under the Roman power, Tyre was given to Cleopatra by Antony. In the 7th century it came into the hands of the Saracens, until taken by the crusaders. Its wealth, made by its trade and manufactures, especially that of the renowned Tyrian purple dye, made it a prosperous city until 1516, when the newly discovered route to Asia by the Cape of Good Hope ended its commerce. Its site is occupied by an unimportant town called Sur, with about 5,000 inhabitants, under the Turkish government of Beirût. Many of the ruins of ancient Tyre have been covered by the sea, but tombs are found cut in the rocks and the remains of a Christian cathedral built in 324.

Tyrol or **Tirol** (*tē-rōl'*), an Austrian province in the western part of the empire, lies north of Italy and east of Switzerland. It covers 11,324 square miles, and is divided into three large valleys separated by mountain ranges — the Tirolese or German Alps on the north, the Rhætian Alps in the center and the Trent Alps on the south. The loftiest peaks in Austria (*q. v.*), many of them in the region of perpetual snow, are in the Tirol. Brenner Pass, the lowest of the great passes of the Alps, is near the center of the province and on the line of travel between Italy and Germany. The Inn, the Adige and the Rhine on its borders are the principal rivers. About one third of the land can be cultivated, the rest being in forest or in the area of snows. The crops are corn, other grains and fruit. Goats and sheep are raised, and chamois, marmots and eagles abound. Gold, iron, copper and coal are found. There are a university at Innsbruck and other schools in the country. The people are divided into the German Tirolese in the north and the Italian Tirolese in the south, and nearly all are Roman Catholics. They are very patriotic, and are noted for their love of home and their national songs.

Tirol under the Romans was a part of Rhætia. It passed back and forth from Bavaria to Austria until 1814, when Austria finally claimed it. In 1809 the insurrection under Andreas Hofer took place, in which men and women fought side by side until hundreds were killed, because their country had been given to Bavaria. Population 981,949. Consult *Tyrol and the Tyrolese* by Grohman and *The Valleys of Tyrol* by Busk.

Tzarsko-Selo or **Sofia,** a town in Russia, 15 miles south of St. Petersburg. It is the summer residence of the czar, and originally was a country-house of Peter the Great. The palace was built in 1744. The main building is 800 feet long, with large wings in addition. The rooms are magnificent, finished in gold, amber, *lapis lazuli* and other precious materials. There are a Gothic castle, an arsenal and a smaller palace, built by Alexander I. Population 55,186.

U

U (*o͞o*), the twenty-first letter, is a vowel, sometimes a semivowel. It is a rounded *v*, both being formerly used both as vowel and as consonant. Not till nearly 1700 was *V* restricted to expressing the consonant. The sound is produced by rounding the lips and raising the back of the tongue, and so *u* is called a labial vowel. The true primary sounds were the long *u* (*ūse*), as in *tool*, and the short *u* (*bŭll*), as in *wood*. *U* also has the sounds heard in *actuate*, *rural*, *fulfill*, *urn*, *up* and *submit*, the variations being due to the accent not falling on *u*. *U* is silent in *antique*, *gauge*, *rogue*. After *g* and *q*, *u* is a *W*, as in *guano*, *queen* and also in *suite*.

Uganda (*o͞o-gän'dȧ*), a British inland protectorate in East Africa, covering the region about the equatorial lakes, Victoria, Albert, Albert Edward, Rudolf and Kioga. The area is estimated at 223,500 square miles, with a native population of about 3,000,000, of whom a third belong to the civilized and Christianized Baganda, speaking a Bantu tongue. They are a miracle of missions, the Anglicans having 250,000 adherents, the Roman Catholics 146,000. Trade is in the hands of German and British trading-firms, and is also carried on by British Indians, Persians and Arabs. The region is fertile, except in Rudolf, the northeastern province, with a rich fauna and flora; while iron, copper and even gold abound. Experiments are being made in growing arrowroot, coffee, cotton and rubber. The Ugandan government railroad extends 750 miles from the coast to Lake Victoria. The protectorate is divided for administrative purposes into five provinces, (Rudolf, Nile, Central, Uganda and Western), over which order is maintained by a force consisting of Sudanese, Uganda Rifles, an armed constabulary and native levies to the number, in all, of 4,000 men. The territory came under British influence in 1890, and four years later it was erected into a British protectorate. The Ugandan province, though directly under British administration, is recognized as a native kingdom. During the minority of the present king three chiefs are regents, and there is a native assembly. In most of the districts the native chiefs govern their subjects. It has mountain elevations from 10,000 to 19,000 feet, with snow-covered peaks, glaciers and volcanoes. The revenue is derived from taxes on huts and guns and from import-duties. The principal exports are ivory, skins and cattle. Nile steamers from Khartum reach Gondokoro on the northern boundary, and ships and steamers ply the lakes. But development threatens to be hampered by lack of native labor, for the inhabitants have been decimated by the sleeping-sickness. Changed boundaries leave the Ugandan railway from Mombasa to Kisimu wholly within the limits of the adjoining East Africa Protectorate. The telegraph has been extended from Entebbe to Gondokoro, crossing the Victoria Nile at Fajao.

Uhland (*o͞o'länt*), **Johann Ludwig,** a German poet, was born at Tübingen in Württemberg, April 26, 1787. He studied and practiced law at Tübingen, was a professor of the German language and literature in the university, a leader in the *diet* and a member of the Frankfort parliament. His writings consist of the dramas entitled *Ernest of Swabia* and *Louis the Bavarian*, works upon early German and Norse literature and mythology and the songs and ballads for which he is famous. The first collection of poems, made in 1815, were patriotic songs, called forth by the war against Napoleon, and more than 50 editions have been published. *The Castle by the Sea* and *The Black Knight*, found among Longfellow's poems, are translations from Uhland, and there have been various translations of his songs and ballads. He died at Tübingen, Nov. 13, 1862.

Uhlans (*ū'lănz*), the light cavalry of the Tartars, who were brought into Europe by their colonies in Poland. They were mounted on Tartar horses, and carried only light arms, as the saber, lance and, later, the pistol. In the Prussian army all the light cavalry are called uhlans. They were conspicuous in the Franco-German War for bravery and agility.

Ujiji (*o͞o-jē'jē*), a district in German East Africa (*q. v.*) on Lake Tanganyika. It is a fertile country, raising groundnuts, peas, beans, plantains, sweet potatoes, egg-plants and yams. Sugar-cane, tobacco and cotton are cultivated to some extent. The people, called the Wajiji, are large and strong, with flat feet, woolly hair and dark skins. In the town of Ujiji, a collection of huts with a bazar where the Arabs trade, Stanley found Livingstone in November, 1871. Population 14,000. See LIVINGSTONE and STANLEY.

Ulfilas (*ŭl'fĭ-lȧs*), a bishop of the Goths, was born about 310, and is thought to have

come from a family of Christians from Cappadocia, taken prisoners by the Goths. He was learned in Gothic, Greek and Hebrew and made a Gothic alphabet of 24 characters, modeled after the Greek. He translated the Bible, all but *Kings*, into Gothic, and his Bible was in constant use among their cities. It is the earliest specimen of any Teutonic language. He became bishop of the Goths in 341, and settled with the Christian part of the nation near Nicopolis, persuading them to practice agriculture and the arts of civilized life. He died at Constantinople in 381. Consult Scott's *Ulfilas, Apostle of the Goths*. See GOTHS.

Ulm, a city of Württemberg, is on the Danube River, 45 miles southeast of Stuttgart. It has one of the largest Protestant churches in Germany, one of the earliest libraries, with a remarkable collection of antiquities, and strong fortifications. Its pipe-bowls are noted and, with fine flour, make a large part of its trade. Ulm was an imperial city of Swabia (*q. v.*), and in the 15th century had within its walls and in the surrounding region belonging to it nearly 100,000 inhabitants. It suffered in nearly all the great German wars, and is the site of the defeat of the Austrian general, Mack, by Napoleon, Oct. 17, 1805. Population 51,820.

Ulysses (*ū-lĭs'sēz*) or **Odysseus** (*ō-dĭs'sūs*), a Greek hero. He was ruler of Ithaca, and feigned insanity to avoid taking part in the siege of Troy (*q. v.*). To show that he was crazy he plowed the sand on the seashore, but Palamedes exposed his deception by placing his infant son in the furrow, when he quickly turned the plowshare aside. Unsuccessful in his mission to demand the return of Helen, he joined in the ten years' siege, being one of the most prominent of the Greek leaders. He fought with Ajax for the prize of Achilles' armor, which he gained, and was one of the Greeks hid in the wooden horse, who captured the city. On the island of the Cyclops, when six of his companions were eaten by the giant, he put out the giant's one eye, and escaped by tying himself and his companions under the bodies of the sheep, which carried the men with them when let loose from the cave. At the island of Æolus that god gave Ulysses a bag containing the favorable winds, but the bag was opened by his followers, and, the winds escaping, the ships were driven back to the island. Circe the sorceress changed part of his followers into swine, but he overcame her spells with the help of Hermes. He passed the island of the Sirens safely by filling the ears of his followers with wax and tying himself to the mast. At Trinacria his followers, while he slept, killed some of the cattle of Helios, which they had been warned not to touch, whereupon a great storm arose, the ship was wrecked, and all on board were drowned but Ulysses. He lived seven years on the island of Ogygia with the nymph Calypso, returned at last to Ithaca after 20 years of absence, and slew the suitors of Penelope, his wife, with the help of Athené and of Telemachus, his son. *The Odyssey* gives the story of his wanderings.

Um'bel, a cluster of flowers in which the pedicels arise in a cycle from a common level, resulting in a flat-topped cluster. Often umbels are compound, each branch of the main cycle terminating in a cycle of pedicles bearing flowers. A cluster characteristic of the great family umbelliferæ. See INFLORESCENCE.

Um'bria, a country of ancient Italy, between the Adriatic Sea and Etruria or Tuscany. The Tiber and the Rubicon were among the principal rivers. It was one of the most powerful states in central Italy, but was conquered by the Romans in 308 B. C. The region is comprised in modern Perugia, a province of the kingdom of Italy. The area is 3,748 square miles, the population 667,210.

Un'alas'ka, one of the Aleutian Islands, the extension seaward of the Alaskan peninsula, which separates the Pacific Ocean from Bering Sea. The island lies at the passageway for steamers from San Francisco, Portland, Ore., and Victoria, B. C., proceeding to St. Michaels, the mouths of the Yukon and to Cape Nome. The chief village adjoins Dutch Harbor, and is named Unalaska, the population of which is about 400. The islanders are principally Aleuts, who support themselves by fishing; there also are a few Russians and Americans. Captain's Bay, a naval rendezvous, is the sheltered waterway in front of Unalaska town. It is 2,060 miles from Portland, Ore., and 2,344 from San Francisco.

Un'cas, an Indian chief of the Mohican tribe in Connecticut. The Mohicans (*q. v.*) were a band collected by Uncas after he had left the Pequot tribe, to which he belonged. He sided with the English in the war against the Pequots, and was so friendly with them that the Indians turned against him. In the wars which took place Uncas captured and killed the chief of the Narragansetts. Serveral tribes made war against him, and the Narragansetts would have starved him out of his stronghold had not the English sent him supplies by night. He was called a cruel and wicked man, but was faithful to his English allies. He died, very old, in 1682.

Uncle Sam, a nickname for the American nation, is a playful extension of the initials U. S. for United States. It corresponds to "John Bull," the nickname of England, as an attempt to personify a nation. It is said that the term originated in a jest made at Troy, N. Y., in 1812. An inquirer was told that the initials U. S., which occurred on certain goods purchased for the govern-

ment stood for *Uncle Sam*, of Samuel Wilson, a citizen of Troy. It is doubtful whether there is any truth in this story. Certainly, however, "Uncle Sam" was an accepted sobriquet for the United States as early as 1817. Uncle Sam is conventionally portrayed as a tall man, thin, with long, narrow beard, long-tailed coat and high hat.

Un'derground' Rail'road', the name popularly applied to the system adopted by many persons in the north, before the Civil War, for aiding fugitive slaves to escape from their masters into Canada, beyond the reach of the fugitive-slave law. Sympathizing abolitionists furnished the fugitives with food, hiding-places, transportation and advice, while they refused information or comfort to their pursuers. The most favored routes lay through Ohio and Pennsylvania. The houses along these routes where aid was given came to be known as "stations;" those persons directly assisting the run-a-ways as "conductors;" those who made contributions of clothing and money as "stockholders" in the enterprise Wm. Lloyd Garrison and Wendell Phillips were stockholders. Among the most active officials was Levi Coffin, who claimed to have actively engaged in the work for 33 years and to have received an average of 100 fugitives annually; he was often styled the president of the concern. Seibert in his exhaustive work on "The Underground Railroad" gives the names of 3,211 "agents, station-keepers and conductors." Many of them were heavily fined for violation of the law, but the practice continued to be one of the chief grievances of the south against the north.

Unga'va, District of, the northern part of Labrador, lies north of the province of Quebec and between the eastern shore of Hudson Bay and the Atlantic. Although it is the portion of Canada nearest Europe, and although the trade of Canada has passed immediately south or north of it for over 200 years, it is the least known portion of the country. It is in the same latitude as northern England and Scotland and the southern portion of Norway and Sweden, but the effect of the Arctic current on its northern and northeastern coast unfits it for agriculture. It is the character and climate of this part of Canada nearest Europe that have done so much to create a mistaken prejudice in the minds of Europeans against Canada's climate and advantages. Forests valuable for paper-making cover a great part of the country. The lakes are large and numerous, fish excellent and plentiful. There is every indication pointing to profitable mineral development, but at present the only industry is the fishing along the coast. In the opinion of Mr. Low, who has considerable knowledge of the country, Ungava possesses a belt of iron-bearing rock probably 100 miles long and 200 to 300 wide. In the future Labrador will supply a large portion of Canada's iron. See Hudson Bay and Labrador.

Ungulates (*ŭn'gû-lâts*), the name for an order of hoofed mammals. The larger proportion of mammals belong to this interesting order, which embraces the species useful to man, as the horse, ox, sheep, camel, pig and deer. They all walk, so to speak, on the tips of their toes, each toe at the end being incased in a horny hoof. They are naturally divided into two groups: the odd-toed and the even-toed mammals. The former includes the horses (*q. v.*) with a single hoof, the rhinoceroses with three toes on each foot and the tapirs with three toes on the hind feet and four (one of which is not used) on the fore feet. The odd-toed mammals (*Perissodactyla*) have had a long geological history, and many modifications can be traced through those found in the rocks. The horse, for example, sprang from ancestors with five toes, and between those remote ancestors and the modern horse with a single toe lie more than two and one half million years (see Evolution). The even-toed forms (*Artiodactyla*) include all those with cloven hoofs, as cattle, deer, sheep, goats, swine and the like. The hippopotamus has four toes on each foot. The swine has four toes, but the two outer are lifted above the ground and not of use in progression, and the cud-chewers have the toes reduced to two. These even-toed mammals likewise have a long history, and in the rocks are forms which lead up to those now existing.

U'nicorn, a legendary animal described by ancient authors as possessing the body of a horse and a single long horn, issuing from the forehead and projecting forward. It was supposed to inhabit India. This fabulous creature became a sign in heraldry. A somewhat similar animal with the cloven hoof and the beard of a goat is depicted on the coat-of-arms of England. The word translated *unicorn* in the Bible refers to some horned creature. It is supposed by some scholars that the buffalo is indicated.

U'niforms of the U. S.: Military and Naval. Of recent years, particularly since 1902, considerable changes have been made in the uniforms both of the army and the navy of the United States regular and volunteer forces. These have been introduced with the design of adapting them more effectively to the conditions of active service and to combine an ornamental and tasteful neatness with the idea of utility, but without undue display or ostentation. In accomplishing the changes the cumbrous helmet has been almost entirely discarded for a serviceable peaked cap (blue or khaki), retaining also the soft, felt, buff-colored campaign hat; while khaki, of a now fast

dye, has been adopted as the dress of portions of the army regiments (infantry, cavalry and engineers), and white has been retained as the working dress of soldiers in addition to officers in the navy. The prevailing color of the army uniform, for tunics or sacks as well as for the full-dress frock, is blue, with a blue of a lighter shade for the trousers; the khaki is of the same shade both for tunics and pants; while the prevailing color of the naval uniform (outside of white) is a dark blue, alike for tunics, frocks and trousers. The bandman's dress in the navy is the red tunic, with light-blue trousers, and helmet. For general and field officers (army) the full-dress coat is the double-breasted frock, with a double row of buttons, with epaulets for general officers and shoulder-straps for inferior ranks. The general officers wear a stripe of gold color, in full dress, down the trouser-leg; while the full-dress frock is adorned with a breast-cord and tassel of the corps, color of the department or arm of the service to which its bearer belongs. In the navy, on all but the white uniforms, the rank of an officer is indicated by gold-lace on the sleeve and devices on the collar, epaulet and shoulder-strap. Stripes of gold-lace of varying widths mark the rank on the sleeve of the officer from ensign to admiral; while all officers of the line or executive branch wear a gold star on the sleeve above the gold-lace.

The shoulder-straps of a second-lieutenant in the *army* are plain. A first-lieutenant's have a silver bar at both ends; a captain's two; a lieutenant-colonel's silver oak-leaves; a major's gold oak-leaves; a colonel's a silver eagle; a brigadier's a silver star; a major-general's two stars of silver; a lieutenant-general's three; the general's two silver stars, between which are a gold eagle and a device. All commissioned officers of the *navy* wear epaulets of gold-bullion on both shoulders, while strips of gold-embroidered, white oak-leaves or of gold-lace and devices on the shoulder-straps indicate the respective ranks.

U'nio, the name for a number of fresh-water mussels very abundant in the United States. Their name would indicate a single shell, but they are bivalves. For their structure see CLAM. Some forms, especially in the streams of Wisconsin, Ohio and New Jersey, contain pearls. These animals are gathered in great numbers, but the pearls are of infrequent occurrence and mostly small. Occasionally, however, those valued as high as $500 to $2,000 have been found. The shells are used for making pearl-buttons.

Union, N. J., a town of Hudson County on Hudson River, one mile from Hoboken. Its chief industry is the manufacture of silk, but it also has a large shirt-factory and breweries. It has the service of the West Shore and New York, Susquehanna and Western railways. Population 17,369.

Union Stock-Yards, Chicago. See STOCK-YARDS.

Uniontown, Pa., a borough, the seat of Fayette County, on the Pennsylvania and Baltimore and Ohio railways, 43 miles south-southeast of Pittsburgh. Settled in 1767, it became a town in 1783, and was incorporated as a borough in 1796. Situated in a region rich in iron, coal and coke, it has developed many industries connected with these minerals, among which are steel-works, carriage-works, a foundry, manufactories of glass-ware, leather and its products, a tannery, a brewery, a flour-mill and machine-shops. It also has natural gas. Population 7,344.

U'nit. See MEASUREMENT.

Uni'ted States of Amer'ica, The, a federal republic in North America, composed of states, territories and districts on the continent, of insular dependencies and possessions in the Pacific and Atlantic Oceans and of the Panama canal-zone in South America. Washington, D. C., is the capital.

AREA AND BOUNDARIES

The continental United States, excluding Alaska (*q. v.*), occupies the central area of North America. It lies between the Atlantic on the east, the Gulf of Mexico and Mexico on the south, the Pacific on the west and Canada on the north. It extends approximately from 67° W. to 125° W. in longitude and from 24° 30′ N. to 49° N. in latitude. Its longest line, east and west, is 3,100 miles; north and south, 1,780. Its continental area, including Alaska, is 2,970,230 square miles. (That of Alaska is 590,884.) But the republic's total territory, when the area of Guam, Guantanamo, Hawaii, the Philippines, Porto Rico (with Culebra and Vieques), the Panama zone, five Samoan islands and many other small American islands in the Pacific is included, comprises over 3,699,130 square miles. (See articles on each.) Part of the northern boundary runs through Lakes Superior, Huron, Erie and Ontario and their connecting waters and through St. Lawrence, St. John and St. Croix Rivers, while the Rio Grande forms part of the southern boundary. The Canadian boundary extends 3,700 miles, the Mexican 2,105, and the entire boundary stretches 11,075 miles. The continental United States and Alaska almost equal all Europe in size, and the entire territory of the republic is surpassed in extent only by that of the British Empire, of Russia and of China. When the sun is setting on Porto Rico and Maine, it is rising on the Samoan and the Philippine Islands; and the American flag dominates the Arctic Ocean of Alaska and the tropical South Sea of Tutuila.

Coastal Features

The coasts on the Atlantic and Pacific Oceans reach 12,101 miles, the Atlantic coast (including that of the Mexican Gulf) being 9,568 miles in extent and the Pacific coast 2,533. This shows that the Atlantic coast, which is only 2,349 miles long if the windings of the shore are not followed and if the 3,551 miles of Gulf coast are deducted, is less regular than the Pacific coast. Consequently the most numerous and the largest harbors are on the Atlantic and face Europe. There are many large inlets and bays. Penobscot, Massachusetts, Cape Cod, Narragansett, New York, Delaware and Chesapeake Bays and Long Island, Albemarle and Pamlico Sounds are the most important indentations on the Atlantic shore. Along the Gulf are Apalachee, Galveston, Mobile and Tampa Bays. On the Pacific are Monterey, San Diego and San Francisco Bays, Puget Sound, the Strait of Fuca and Santa Barbara and San Pedro Channels. Alaska, too, has numerous bays and sounds. The United States shores of the Great Lakes (*q. v.*) add 3,000 miles more to the continental coasts of the republic. Their total length, following the windings of all shores, is 22,609 miles. (Those of Alaska and the islands cannot here be given.) There are no large islands off these coasts, Long Island (*q. v.*) being the most considerable. Next in importance come the islands off Maine and Massachusetts and the Santa Barbara group off California. Alaska has many large islands. Cuba is but 90 miles south of Florida, and southeast of Florida lie the nearby Bahamas. Prominent projections on the Atlantic coast are Capes Cod and Hatteras and the peninsula of Florida; in the Gulf the Mississippi delta and Cape San Blas; and on the Pacific Cape Mendocino. (See titles and Coast-Survey.)

Surface and Drainage

The United States divides naturally into four physical regions, two of which are elevations and the others lowlands. The elevated regions are the Appalachian Mountains in the east and the Rockies in the west, both trending north and south in general. (See Alleghany and Rocky Mountains.) There also are the Ozark Mountains of Missouri and the Black Hills of South Dakota. The lowland regions are the Atlantic slope and the Mississippi valley, the Pacific lowland being too narrow to form a main division.

The Appalachians extend from Canada into Georgia and Alabama, nearly parallel with the Atlantic, 20 to 100 miles inland, and known from north to south as the Height of Land in Maine, the White Mountains in New Hampshire, the Adirondacks and Catskills in New York, the Berkshires in Massachusetts and Connecticut, the Highlands in New Jersey and the Alleghanies in Pennsylvania and the south, where they have parallel ranges, as the Blue Ridge. (See articles under titles above.) This mountainous country, with heights of 6,000 feet, is about 100 miles wide, and forms nature's barrier between the Atlantic slope and the Mississippi valley. It, however, is broken by the Connecticut, Hudson, Mohawk, Delaware, Susquehanna, Potomac and James Rivers. (See these titles). Mitchell's Peak and Mount Washington are its highest points.

The Rockies, about 1,000 miles west of Mississippi River, reach from Mexico into Alaska. Their width averages 300 miles, though at some points it reaches 1,000 miles, and many of their peaks in the United States top 14,000 feet. The Sierra Nevada of California, the Cascade Range of Oregon and Washington and the Coast Range are parallel ridges of the Rocky Mountains. Mt. Whitney of the Sierra Nevada rises 14,887 feet and Mounts Hood and Shasta and Long's and Pike's Peaks are nearly as high. In Alaska Mt. McKinley towers 20,464 feet, the loftiest height on the continent; and St. Elias 18,024. (See the titles).

The Atlantic slope, between the Appalachians and the ocean, generally has low coasts, sloping inward to the hilly regions or Piedmont (*q. v.*) at the base of the mountains. Many of its rivers are navigable, the larger streams flowing more than 300 miles. Among these are the Penobscot, Kennebec, Hudson, Connecticut, Delaware, Susquehanna, Potomac, James, Cape Fear, Neuse, Roanoke, Santee, Savannah and Altamaha. (See titles). Small lakes also abound in New England and the middle states. The streams emptying into the Gulf include the Chattahoochee, Alabama, Pearl, Mississippi, Sabine, Trinity, Brazos, Colorado of Texas, Nueces and Rio Grande. The junction of the Atlantic slope and the Piedmont is marked by a ridge called the falls' line, because the streams from the Appalachians drop at this uplift and create the water-power of New England, the middle Atlantic states and the eastern states of the south. (See articles on the rivers named.)

The vast interior plain between the Appalachians and the Rockies and Canada and the Mexican Gulf is watered by the mighty Missouri and Mississippi and their 10,000 tributaries and is one of the most fertile regions on the globe. Its hills are covered with forests and its plains and prairies produce the huge crops of grain and cotton that feed and clothe the world. The eastern part of this central region is hilly, and West Virginia and eastern Tennessee and Kentucky are covered with heavy forests. The center is prairie, merging toward the Rockies into enormous plains covered with wild

grass, sage-brush and cactus, having but slight rainfall and depending on irrigation (*q. v.*) to render it profitable to cultivate. In the north the plain drains into the Great Lakes and forms the lake region; in the south, where it meets with the Atlantic plain in Alabama, it drains to the Gulf and forms the Gulf region, which extends from Georgia and Florida far into Texas. The great rivers of the Mississippi valley are the Missouri and the Mississippi and their chief branches, as the Ohio, Minnesota, Wisconsin, Yellowstone, Dakota, Platte, Des Moines, Illinois, Kansas, Arkansas, Red and Yazoo, to say nothing of such tributaries of the Ohio as the Cumberland, Tennessee or Wabash or of the tributaries of the other chief branches. Many of these and their tributaries extend from 1,000 to 2,000 miles. The Mississippi valley is also bordered by the world's largest bodies of fresh water, which the St. Lawrence connects with the Atlantic, while Wisconsin, Minnesota and Michigan are noted for numerous small lakes.

The Pacific slope comprises the most varied region of the United States, broken by great plains and lofty mountain-valleys 10,000 feet above the sea, descending by great steps to the lower levels. It has huge cañons — river-beds thousands of feet deep; arid plains; heavy forests in the north; and a great basin without drainage to the sea. Here is the famous Great Salt Lake of Utah. Its rivers are the Columbia and its branches; the San Joaquin; the Sacramento and the Colorado of the west, all flowing into the Pacific.

The drainage-systems of the United States number five, and have already received full description in the article on AMERICA (NORTH). They comprise the Atlantic, Gulf (including the Missouri-Mississippi system also), Great Basin, Lake and Pacific river-systems. (See articles on each topic). They give the country 100,000 miles of inland navigation — the most extensive in the world. Among the minor lakes, in distinction from the Great Lakes, may be mentioned Champlain, Moosehead, Oneida and its famous sister-lakes in New York, Salt Lake and Tahoe. (See these titles).

Natural Features. No country equals the United States in beauty, grandeur and variety of scenery. Among the many interesting features are Crawford Notch, Delaware Water-Gap, the Hudson Highlands and Palisades, Watkins Glen, Niagara Falls, Luray Cave, the Natural Bridges in Utah and Virginia, Harper's Ferry, Mammoth Cave in Kentucky, the vast prairies, the inland seas, the mighty streams of the interior, St. Anthony and Minnehaha Falls, the Dalles of the Wisconsin, the Pictured Rocks, the passes of the Missouri and of the Columbia through the mountains, the falls of the Yellowstone, Snake and Missouri Rivers, Yellowstone Park, the hot-springs and the geysers, Yosemite Park and Falls, the Big Trees, Royal Gorge, Grand Cañon and the Yellowstone Cañon. (See articles under titles above and GEOGRAPHY, GEOLOGY and GEOLOGICAL SURVEY.)

CLIMATE

The climate of a country stretching over 24½ degrees of latitude and ranging from coastal plains to lofty mountains and tablelands varies greatly. In most parts of the land it is extremely changeable, with great variations of temperature between summer and winter. The Atlantic states are colder than European countries in the same latitudes, but the Pacific coast has a climate as mild as Italy's. The Gulf states and Georgia and South Carolina verge toward a subtropical climate. The rainfall is plentiful, except in some parts of the west, and is distributed throughout the year, except on the Pacific coast, where it occurs in spring and in winter. There also is every variety of soil, including prairie lands covered with rich mould, sometimes 25 feet deep, and the sterile, arid plains of the Utah or Great Basin. (See AGRICULTURE, AMERICA, COLD WAVE, RAIN and SOIL.)

RESOURCES

These consist of the natural products of the soil and the waters, as minerals, forests, native plants and animals and fish and other aquatic animals. Their vast variety and abundance, with the great range of climate, make the United States a world in itself, able to raise almost all products of the temperate and the tropical zones. For the flora and fauna see AMERICA and articles on such subjects as, *e. g.*, CORN or DEER.

Minerals. These include coal, copper, gold, iron, lead, mercury, nickel, platinum, precious stones, silver, zinc and such building-stones as granite, limestone, marble, sandstone, slate and trap. (See articles under titles above.) Aluminum, asphalt, clay, gypsum, mineral springs, natural gas, petroleum, Portland cement, phosphate-rock and salt also abound. (See articles on each.) In the production of aluminum, coal, copper, iron, lead, natural gas, petroleum, quicksilver, phosphate-rock, silver and steel the United States ranks first; in producing gold it stands second; in zinc third. In 1906 the production of gold was 4,565,333 ounces or $94,373,800; of silver 56,517,900 ounces or $38,256,400; of coal (anthracite and bituminous) 375,397,204 metric tons worth $566,857,953; of iron 25,712,106 tons; of steel 23,738,587 tons, the value of the steel and iron tonnage together being $1,000,000,000; and of lead 350,153 tons worth $39,917,422. In 1907 *all* mineral products were worth $2,069,289,-

196; nonmetallic ones $1,166,165,191; and metallic ones $903,024,005. Much of the vast mineral wealth, especially in the south, remains undeveloped.

Forests. A greater variety of trees is found in the United States than in Europe, though nearly all European trees are found here, and originally forests covered a third of the country. But many sections in the Appalachians and around the Great Lakes have been stripped almost bare. Ash, beech, birch, chestnut, maple, oak, pine and walnut abound in the east; hemlock, spruce and white pine in the north; Douglas fir, redwood, sequoia and yellow cedar on the Pacific slope; and cypress and yellow pine in the south. (See articles under titles above.) The prairies originally were treeless as a whole, except along streams, but forests have been planted to a considerable extent. Nearly 1,100,000 square miles of the United States are woodland, nearly a third being on the Rockies and along the Pacific. Probably the heaviest stand of timber on earth is found in California, Oregon and Washington. See AMERICA (*Animals and Vegetables*); EUROPE (*Natural History*); FOREST-RESERVES; LUMBERING; and NATIONAL PARKS.

Fish and Game. The varieties of fish in United States waters number 816, of mollusks 1,000; while the mammals number 310 varieties, the birds 756. The most important fish, commercially, are the bluefish, cod, halibut, herring, mackerel, menhaden, sardines and shad of the Atlantic; the redfish and tarpon of the Gulf; the salmon of the Pacific; and the bass, perch, pickerel, pike, muskellunge, salmon, trout and whitefish of the inland waters. The chief gamebirds and waterfowl used as food are ducks, grouse, pigeons, quail, turkey and wild geese. The most important game-animals are antelope, bear, deer, mountain-sheep (nearly extinct) and moose. The chief edible mollusks are clams, lobsters, oysters and scallops. The terrapin is another marine delicacy. (See articles under titles above and FISH-CULTURE, FISHES and FURS.)

INDUSTRIES

The chief classes of industries in the order of importance are manufacturing, agriculture (including stock-raising), mining, forestry (or lumbering) and fishing. In each of these industries the United States lead the world. The value of the products of manufactures in 1905 was $14,802,147,087; of those of agriculture, in 1907, $7,412,000,000, that of farm-animals being $4,423,697,853; of those of mining $1,904,007,034 in 1906; of those of lumbering $580,022,690 in 1905; and of those of fishing $59,977,339, while the output of the fish-canneries was worth $26,377,210. Thus the four main groups of industries annually average an output worth over $28,000,000,000.

Manufactures. During the last 40 or 45 years manufactures have expanded more rapidly than has any other class of industries. The east has become an almost exclusively manufacturing section, but the interior and the south have made enormous strides as manufacturers. Abundant natural resources from farm, forest, mine and waters; cheapness and plentifulness of fuel; fine water-power, with steam and electricity; inventive genius in the people; intelligence, industry and thrift; exceptional facilities for transportation; millions of immigrants; unhindered commerce between the states; and unequaled advantages for labor as well as for capital from the laws of the land, the national and state constitutions and the democratic nature of American society—have all combined to make the United States the source of a third of the world's manufactures. The sole disadvantage has been the high price of labor. This has been offset by its efficiency and the low cost of food and clothing. The 1905 census of manufactures, the first to be confined to factories and to exclude local industries and hand-trades, grouped them as follows according to the value of the output: Food and kindred products; iron and steel and their products; textiles; lumber and its remanufactures; chemicals and allied products; miscellaneous industries; metals (other than iron and steel) and metallic products; paper and printing; leather and its finished products; vehicles for land-transportation; liquors and beverages; clay, glass and stone products; tobacco; and shipbuilding. Among these 14 groups food and kindred products led with a value of $2,845,234,900 and shipbuilding comes last with $82,769,239. Iron, steel and their products were worth $2,176,739,726; textiles $2,147,441,418; lumber and its products $1,233,730,336; chemicals and allied products $1,031,965,263. The establishments numbered 216,262, representing an investment of $12,686,265,673; having a force of employés (salaried and wage-earning) of 5,990,072; and paying them $3,185,301,763. The food-industries include canning and preserving, dairying, flour-making and grist-milling, rice-cleaning, sugar-refining and slaughtering and meat-packing. The textiles manufactured are carpets and rugs, cottons, hosiery and knit-goods, silks, woolens and worsteds. Iron and steel manufactures, which in 1905 had 343 blast-furnaces and 81 converters, produce bars, castings, blooms, forgings, ingots, plate, rails, slabs and structural shapes. Tin-plate to the value of $28,429,971 was produced. The chemical and allied industries included acids, cottonseed-product, dye-stuffs, extracts, explosives, fertilizers, gas, paints and petroleum-refining. Elec-

tricity, gas, steam, water and even windmills and animals were used to produce power. The manufacture of electrical apparatus has become an immense industry, and in making agricultural machines and tools the United States excels every other country. The hand-trades and the local industries annually produce over $1,200,000,000 of goods. The manufactures of the United States equal those of France, Germany and the United Kingdom together. (See FURNITURE, GLASS, SMELTING and STEEL; articles on other manufactures; and the subject of *Manufactures* in articles on states.)

Agriculture. For more than a century the United States has been the greatest agricultural country on the globe. The American farmer in two years produces more wealth than have all the gold-mines of the entire world since 1492. The immense extent of fertile land, the liberal policy of the national government as to the public domain (see HOMESTEAD LAWS and PREËMPTION), the climatic advantages and the comparative ease of access are among the causes that brought about this preëminence. In the continental United States, excluding Alaska and the islands, there remained 406,349,094 acres of public lands on July 1, 1907, still available for settlement. Most of this, however, is in mountainous and arid regions. In 1900 the farms were worth $20,439,901,164. The size of an average farm is nearly 150 acres. Agriculture employs nearly 11,000,000 people, almost half of all laborers in the United States, and almost 5,000,000 families live on farms. The chief agricultural areas are the central plain from the Appalachians to 100° W.; the Gulf states and Georgia; and the Pacific slope. But the Atlantic slope also abounds in valuable farms on its fertile lowlands; and the soil of the arid regions along the Rockies — regions comprising nearly a third of the United States — is generally fertile and only needs irrigation (*q. v.*). New York and New England chiefly engage in mixed farming and in dairying; the Mississippi valley grows the cereals; the south cotton, sugar, tobacco and tropical fruits, besides truck-farming for northern markets; and the Pacific coast grain and fruits. The agricultural products of the United States form the bulk of the exports.

Cereals are the most important farm-product, and corn (*q. v.*) leads in the amount grown. In 1907 the yields were 2,592,320,000 bushels of corn; 754,443,000 of oats; 634,087,000 of wheat; 153,597,000 of barley; 31,566,000 of rye (some European countries far surpassing the United States as producers of rye); 18,738,000 of rice; and 14,290,000 of buckwheat. (See articles under these titles.) In 1906 the corn of the United States was worth $1,166,626,179; the wheat $490,332,760; and the oats $306,292,978. *All* cereals in that year totaled 4,854,514,837 bushels and were valued at $2,065,886,900.

Cotton (*q. v.*) stands next to corn as a commercial asset of the United States. It is the chief product of the south, and in 1906 it was worth $640,311,538. The cotton-states from first to last in production are Texas, Georgia, Mississippi, Alabama, Oklahoma, South Carolina, Louisiana, Arkansas, Tennessee, Florida, Missouri, Virginia and Kentucky. Kansas raised 21 bales.

The humble hay-crop, however, has sometimes been worth even more than cotton, though lacking its commercial and industrial importance, for in 1907 it weighed 63,677,000 tons and was valued at $743,507,000.

Potatoes (Irish and sweet) come next in value ($177,417,232), Wisconsin, Minnesota and New York raising Irish potatoes in large quantities, and southern Illinois and the south the sweet potato. See POTATO.

Fruit-raising, taken in the widest sense, is a great branch of American agriculture. In Delaware, Florida, New Jersey, southern California, western New York and western Michigan it is the leading industry of the farm. In the mountainous regions of Montana, in Oregon and in Washington it also is a great industry. Oranges and pine-apples are the chief fruits of Florida; almonds, apricots, grapes, lemons, oranges and prunes of the greatest importance in California; grapes in New York and Ohio; apples in New York and New England; peaches in Michigan and Georgia. Small fruits, as blackberries, gooseberries, raspberries and strawberries, are grown almost everywhere. Over half a billion bushels of apples, apricots, grapes, peaches, pears, prunes and small fruits are raised, apples being largely exported, and the value of the fruit crops, nuts and orchard products in 1900 was $140,000,000. (See FRUIT and articles under titles as above.)

Tobacco (*q. v.*) is another of the great crops. In 1907 it was raised on 820,800 acres to the amount of 698,126,000 pounds and the value of $76,234,000. For rice and sugar see articles under these titles. In 1905–6 the output of cane-sugar was 268,193 tons; and in 1907–8 that of beet-sugar was 420,000 tons, the sugar-beet being cultivated in many of the states with temperate climates. Considerable flax is grown, chiefly for seed, in Minnesota, Wisconsin and some other states of the north, the yield in 1907 being 25,851,000 bushels.

Stock-raising (including poultry-farming) and dairying are other great branches of American agriculture. In 1905 the dairy-factories used 12,183,375,885 pounds of milk, and made 531,478,141 of butter; 317,144,872 of cheese; and 308,485,182 of condensed milk, the value of the three being $168,182,789. New York, Wisconsin and

Iowa have the largest dairy-industries. The leading states in the raising of poultry are Iowa, Illinois, Missouri, Ohio and Indiana. Among the grazing states Texas leads in the raising of cattle, Montana in that of sheep. In 1907 the wool-clip was 298,294,750 pounds, the United States ranking only fourth among the wool-producing countries of the world. (See DAIRY-FACTORY, GARDENING, GRAZING, POULTRY, RANCHING, STOCK-RAISING and WOOL.)

Mining. This stands third among the groups of industries of the United States. The total quantity of ores, minerals and metals produced can not be given, because the measures for the different products differ, but in 1906 their value was $1,904,007,634. (See MINING and articles on such subjects, in alphabetical order, as ALUMINUM, MICA or ZINC). Gold is produced mainly in Colorado, California and Nevada; silver in Colorado, Montana, Utah and Idaho; sapphires in Montana, North Carolina and Idaho; and turquoises in Arizona and New Mexico. Agates, amethysts, beryls, diamonds, garnets, pearls, rubies, quartz crystals and tourmaline are also found. (See articles under these titles.) Since 1902 about $1,500,000 of precious stones (*q. v.*) have been mined.

Lumbering. This industry ranks fourth among those of the country, the manufacturing, agricultural and mining *groups* of industries preceding it, as do also the *single* industries of steel and iron, textiles and slaughtering and meat-packing. Two thirds of the woodland are in the east and south, less than a third being on the Pacific slope and the Rockies. The merchantable forests cover 500,000 square miles. Of the 320,000 square miles of these forests in the east, the lake states and the south 175,000 are soft wood and the rest hard wood. The white pine is in Michigan, Minnesota and Wisconsin, the yellow in the southern states. In 1905 there were 19,127 lumbering establishments with a capital of $517,224,128. They used $183,786,210 of raw material. The finished product, excluding fuel, minor products, naval stores and woodpulp, was worth $580,022,690. The value of the sawn lumber was $435,708,084. Four fifths of the cut come from the conifers. See FOREST, LUMBERING, PINE and articles on such states as CALIFORNIA, GEORGIA, MAINE, MICHIGAN, OREGON, WASHINGTON and WISCONSIN.

Fishing. In the extent and value of its fisheries the United States leads the world. The industry employs 6,931 vessels and 219,139 men; has a capital of $93,874,269; and produces to the value of $59,977,339. (The statistics include Alaska and sealing). The Atlantic states produce about 75% of the output, the Pacific states 15, the Great Lakes and the Gulf five each (about 50,000 tons each annually). The total fish-catch is over 1,000,000 tons a year, the aggregate catch from waters not included in the enumeration being considerable. Alaska, Oregon and Washington put up salmon; Massachusetts cures cod, herring and mackerel; and Maine tins sardines. Fish-canning and fish-preserving establishments in 1905 numbered 373, and employed 6,959 wage-earners. The capital was $19,853,016, the value of the material $15,885,354 and that of the output $26,377,210. (See articles under titles above and BERING SEA, FURS and SEALS).

COMMERCE

This is both domestic and foreign. The first is larger than that of any other country, and greatly surpasses that with outside nations. As shipments of interstate commerce are not entered at custom-houses, no statement as to the amount of domestic commerce can be made. But in foreign commerce, though America is only third among nations, our exports in 1906–7 were $1,435,179,017 and the imports $991,087,371. The best customers of the United States are the United Kingdom and Germany, both as buyers and as sellers, Canada coming third as a purchaser and France third as a seller. Over $1,298,452,380 of our *exports* in 1906–7 (excluding gold and silver) went to Europe, but only $349,840,641 to North America outside of the United States. Asia and Oceania took $133,889,857; South America $82,157,174; and Africa $16,511,026. From Europe we *imported* $747,291,253 of products; from North American countries $263,576,349; from Asia and Oceania $242,260,820; from South America $160,165,537; and from Africa $21,127,466. Our chief *exports* consist of cotton ($481,277,797 in 1907); meat and dairy-products ($202,392,508); breadstuffs ($184,120,702); and iron, steel and their products ($181,530,871). Agricultural products form nearly two thirds of the *exports*, manufactures less than a third. The leading *imports* in 1906–7 were sugar ($92,806,253); hides and skins ($83,206,545); chemicals, drugs and dyes ($82,997,914); coffee ($78,231,902); cotton-goods ($73,704,636); and raw silk ($71,411,899). Raw materials formed 38% of the *imports;* animals and foods 21; manufactures 17; and luxuries 15. The Atlantic slope transacts two thirds of the foreign commerce of the United States, New York doing practically half of the country's trade abroad, and in 1905–6 the duties on imports yielded over $300,000,000. (See COMMERCE, CONSULS, FREE TRADE, OCEAN-ROUTES, PROTECTION, TARIFF and TRADE-ROUTES.)

COMMUNICATION

Transportation in the United States is effected by means of waterways, roads, steam railroads and electric railways.

DOMINION OF CANADA
UNITED STATES OF MEXICO
Vancouver Island
Strait of Juan de Fuca
Victoria
Nanaimo
Asheroft
Okanagan
Arrow Lake
Revelstoke
Calgary
Fort McLeod
Saskatchewan
Lake Winnipegosis
Lake Manitoba
Yorkton
Qu'Appelle
Portage la Prairie
Brandon
Kemnay
Estevan
Pasqua
Medicine Hat
Lethbridge
Shelby Jc.
Pacific Jc.
Ashfield
Brocton
Lenox
Port Assiniboine
Great Falls
Fort Benton
Craig
Lewistown
Missouri River
Buford
Williston
Bottineau Mts.
Turtle Mts.
Langdon
Devil's Lake
Towner
Larimore
Grand Forks
Carrington
Jamestown
Dickinson
Missouri R.
Glendive
Flatwillow River
Yellowstone River
Miles City
New England City
Manlan
Bismarck
Greef
Edgeley
Kulm Jc.
Valley City
Ashcroft
Aberdeen
Ipswich
Redfield
Belle Fourche
Whitewood
Rapid City
Pierre
Woonsocket
Chamberlain
Hot Springs
Mitchell
Stou
Yankton
Elkhorn
Valentine
Norfolk
Neligh
Ord
Grand Island
Kearney
Lincoln
Wallace
Holdrege
Culbertson
Yuma
Norton
Phillipsburg
Downs
Concordia
Clifton
Manhattan
Abilene
Oakley
Russell
Great Bend
Larned
Dodge City
Kingman
Arkansas
Wellington
Winfield
Coffeyville
Independence
Parsons
Fort Scott
Pittsburg
Joplin
Springfield
Kansas City
Topeka
Atchison
St. Joseph
Omaha
Council Bluffs
Sioux City
Yankton
Sioux Falls
Watertown
Huron
Aberdeen
Ipswich
Redfield
Woonsocket
Mitchell

Longitude West 90° from Greenwich.
85°
75°
70°
CANADA
Cat Lake
Albany River
St. Joseph Lake
English R.
Lac Seul
Rat Portage
LAKE NIPIGON
Long Lake
Abitibi R.
Lake Abittibi
Ruperts River
Mistassini Lake
GULF OF ST. LAWRENCE
Lake St. John
Chicoutimi
Metapedia
Riviere du Loup
Chaleurs Bay
New Castle
FREDERICTON
Rainy Lake
Rainy R.
HUNTERS
Pt. Arthur
Isle Royale
LAKE SUPERIOR
Parlee
Grand Lake Victoria
QUEBEC
Levis
Three Rivers
Sorel
MONTREAL
Richmond
Ely
Allen Jo.
Allouez
L'Anse
Sault de Ste. Marie
Sudbury
Nipissing Jc.
Ottawa
OTTAWA R.
Soo Jc.
Manistique
Escanaba
St. Ignace
Halliburton
Carleton Jc.
Prescott
Kingston
Hurley
Superior Jc.
Pembine
Chicopee
Traverse City
Alpena
Wiarton
Barrie
TORONTO
Hamilton
Port Austin
Grayling
Cadillac
Port Huron
London
St. Thomas
Lake St. Clair
DETROIT
CHICAGO
MILWAUKEE
MADISON
Fond du Lac
Portage
Oshkosh
Manitowoc
Green Bay
Menominee
Marinette
Escanaba
Iron Mountain
Ishpeming
Marquette
Munising
Soo
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
BUFFALO
Rochester
Syracuse
Utica
Albany
Troy
Schenectady
Hartford
Springfield
Worcester
Boston
Lowell
Salem
Concord
Portsmouth
Augusta
Portland
Bangor
Mechanics Falls
Rockland
Waterville
Newport
Belfast
Ellsworth
Calais
St. John
Houlton
Woodstock
Fredericton
Chatham
Dalhousie
Campbellton
Gaspe
Pictou
Truro
Halifax
Yarmouth
Digby
Annapolis
Kentville
Windsor
Amherst
Moncton
Sackville
Shediac
Charlottetown
Summerside
Pictou
Antigonish
Sydney
Louisburg
Cape Breton
Prince Edward Island
Cape Tormentine
Cape Traverse
Cape Ray
Port aux Basques
Bay of Islands
Corner Brook
Grand Falls
Bay of Exploits
Gander
Trinity
Bonavista
Cape Bonavista
Cape Race
Placentia
St. John's
Conception Bay
Harbor Grace
Carbonear
Twillingate
Fogo
Notre Dame Bay
Labrador
Anticosti
Magdalen Islands
Cape Breton

Communication is carried on by means of these and also by telegraphs, telephones and postal service. The waterways consist of the seas, rivers, lakes and canals. The last three offer 100,000 miles of inland navigation. The 38 principal canals used for commercial purposes extend nearly 2,500 miles. The Missouri-Mississippi system and the Great Lakes are the most important means of internal transportation by water. (See CANALS, GREAT LAKES and articles on rivers and states.)

American shipping in 1907 comprised 10,866 sailing-vessels (excluding canal-boats and barges) and 10,050 steamships (*q.v.*), the tonnage of both classes aggregating 6,938,794 tons. The foreign commerce is, nine tenths of it, carried in foreign ships. The Atlantic and Gulf shipping is two thirds of the total American shipping and half of the tonnage. That of the lakes is an eighth of the number and a third of the tonnage. (See SHIPBUILDING.) The tonnage engaged in fisheries numbers 66,727 tons; in foreign trade only 861,466 tons; but in coastal trade 6,010,601 tons. The Atlantic ports had two thirds of the shipping that entered and cleared.

The railways of the continental United States date from 1826, and in 1907 their total mileage was 228,128 miles, nearly half of the world's railway mileage and much more than that of Europe. As Britain is the island of ships, so the United States is the continent of railways. They penetrate every state and territory, even Alaska, Panama, Porto Rico and the Philippines; employ 1,521,355 men whose annual wages average $750,000,000; and in 1907 they carried 815,774,188 passengers and 1,610,099,829 tons of freight. Their passenger-cars would make a train over 500 miles long, their freight-cars and engines another of nearly 10,000 miles' length. There are about 1,000 companies operating them. (See HARRIMAN, HILL, MORGAN and RAILROADS.) The United States systems also interlink with the Mexican and Canadian systems, American trains running from St. Louis into the City of Mexico, the Canadian Pacific crossing Maine and the Grand Trunk entering Portland and Chicago. In 1906 there were 36,931 miles of street and elevated roads, only 719 miles being worked by other power than electricity, and in densely peopled regions they are girdling the country with a network of interurban lines. (See ELECTRIC RAILWAY.) Wagon-roads, except in a few sections of the east, are inferior to those of Europe.

The telegraph and the telephone in the United States are private enterprises. In 1907 one company had 1,321,199 miles of wire and 24,760 offices, and sent nearly 75,000,000 messages, excluding railway messages and those over leased wires. In 1906 the next largest company had 321,570 miles of wire and nearly 24,000 offices. Six cables connect the United States and Europe, while another links it with the Philippines and China. There also are cables to the Antilles and South America. One of the telephone companies in 1907 had over 6,000,000 miles of wire, over 7,000,000 instruments and over 90,000 employés. Its telephones were used 5,305,900,000 times. Other companies operate over 3,500,000 instruments, and have greatly developed long-distance telephony. The capital invested in telegraphy is over $150,000,000, in telephony over $500,000,000, and continuous telephonic communication is had between points as distant as Birmingham and Minneapolis or Philadelphia and Kansas City. See CABLES, TELEGRAPH and TELEPHONE.

The postal business is carried on by the federal government (see POSTOFFICE and DEAD-LETTER OFFICE), the transportation of small or valuable freight by private express-companies, though large goods are also forwarded through them if speed or special safety is desired. (See EXPRESS COMPANIES.) In 1907 the postoffice handled 20,535,311,484 pieces of mail at a cost of $190,238,288 at 62,663 offices. The rapidity of travel and communication in the United States is evinced by the fact that it takes the mail only four days and nine hours to traverse the 3,250 miles between New York City and San Francisco.

GOVERNMENT

This is based on the federal constitution of 1787 and the constitutions of the states. The national government (*q. v.*) began in 1774; the states when the first continental congress initiated their governments. The United States government is a federal republic, and each state is a representative republic, governing itself in its own affairs but without sovereignty and without any relation to any foreign power. The national constitution, which can be altered by the people, defines the powers of the federal government, and reserves "to the states respectively or to the people the powers not delegated to the United States by the constitution nor by it prohibited to the states." The administration of the affairs of the Union is entrusted to the executive, the legislative and the judicial authority.

Executive power is vested in a president (*q. v.*), the head of the government, and in a vice-president. Both are elected for a four years' term by an electoral college (*q. v.*). The president is commander-in-chief of the army and navy, though never appearing at their head, and of the militia in the service of the Union. Washington, for greater efficiency in the executive, in 1789 established the extraconstitutional departments of the navy, the postoffice (a

postal system, however, existing before the Revolution), state, treasury and war; and in 1849 that of the interior was added, in 1870 justice, in 1889 agriculture, and in 1903 commerce and labor. (See UNITED STATES DEPARTMENTS.) The heads of these are executive officers, called secretaries (except the attorney-general and the postmaster-general); are appointed by the president with the approval of the senate; and form his cabinet (*q. v.*) or body of advisers. The president also appoints ambassadors, judges of the federal courts and almost all of the higher executive officers. (See DIPLOMATIC SERVICE). In the civil service (*q. v.*) of the Union there are nearly 330,000 executives. The vice-president is president of the national senate, *ex officio*, and, if the president die or resign, becomes president. His salary is $12,000 a year. If the vice-president die, a temporary president of the senate discharges his duties and receives his salary.

Legislative authority over the Union is vested in a national congress (*q. v.*), consisting of a senate and a house of representatives The first, nominally the ranking authority, represents the states; the second the people. The latter is chosen by direct popular vote, the former by the legislature elected in a state by its citizens. Each state, whether small or large, has two senators, but has only so many representatives in the lower house as its population entitles it to. Nevada, *e. g*, has only about 50,000 inhabitants, New York over 8,000,000; yet Nevada as a state has two senators, but its people have only one representative in the house. As there is one representative to every 193,284 inhabitants, states of less population are given a representative. Representatives are elected for two years, senators for six, but a third of the senate goes out every two years. Territories send delegates to the house of representatives, Porto Rico a resident-commissioner. These are elected as representatives are; can speak in the house and make motions; but cannot vote. The salaries of senators, representatives, delegates and the Porto Rican commissioner are $7,500 a year (since March 4, 1907), with their expenses in travel, but the speaker receives $12,000. Alaska and the Philippines have an inofficial representation, but the District of Columbia has not even this. Congress governs the territories and districts and has power to enact legislation affecting the whole country, but it cannot change the laws of a state.

Judicial authority over the nation is vested in a supreme court, nine circuit-courts, a court of claims and 69 district-courts. (See COURTS.) Each circuit also has a court of appeals. There also are federal courts for the districts and for the territories. The national courts try civil causes arising from the laws of the *nation;* causes between citizens of different states; and crimes against the *whole* United States. These crimes consist chiefly of murder on the high seas, offences against postal or revenue laws and piracy. The judges of these federal courts are appointed for life by the president with the approval of the senate. Each state forms a district or several districts. The chief-justice of the supreme court receives $10,500 a year, the eight associate-justices $10,000 each. (See, also, CONGRESS and UNITED STATES DEPARTMENTS: JUSTICE.)

Each branch of the federal government is independent, within limits, of the others. To a degree they are coördinate. Yet all are so related together as to form a whole. The president or executive can veto a law of Congress and has such powers of a sovereign as appointing ambassadors and judges; but Congress, if two thirds of the senators and two thirds of the representatives sustain the vetoed law, can pass it; and the senate can refuse consent to his appointments. Only Congress can originate legislation; but the federal courts determine whether its laws are in keeping with the national constitution. Yet Congress has judicial functions, too, for the house alone has the power of impeachment and the senate then sits as a high court. The senate also has the excutive function of ratifying or rejecting treaties that the president makes with foreign countries. It is such features as these that made Gladstone pronounce the federal constitution "the most wonderful work ever struck out at a given time by the hand and purpose of man."

The states' governments mainly follow that of the nation. Each state must have a republican constitution, but this derives its powers from the citizens of the state. Admission of territories to the Union as states is effected by act of Congress and proclamation of the president. The state deals with all matters not reserved for the national government by the federal constitution nor falling within restrictions imposed by its own. It determines the qualifications for suffrage, and controls all elections. It also controls criminal and civil law, prisons, property and civil relations; marriage, divorce, education and charities; fisheries, game-laws, licensing and traffic. It charters and controls all corporations (*q. v.*) subject only to Congress's right to regulate interstate commerce; and it also regulates labor (*q. v.*). The state derives its revenue chiefly from a direct tax on property. (See *Government* in articles on states). Local government within a state is carried on by a borough or a municipality and by a county or a township. (See CITIZENSHIP, FACTORY LEGISLATION, MUNICIPAL GOVERNMENT and TOWN-MEETING.)

Territorial governments are states' govern

ments in the making. A territory is a possession of the Union, and is governed by national or federal authorities. The president appoints its officers, but the people elect a legislature, though federal statutes may modify or even annul its laws. The Districts of Alaska and Columbia have no power of self-government. Indians on reservations and non-naturalized inhabitants of the United States are ruled by the federal government. When territories become populous enough and attain industrial or commercial importance, they may, if they wish, become states by forming a constitution, organizing a government and satisfying Congress that they have complied with all requirements of the national constitution. (For the forms of government in Alaska, the District of Columbia, Hawaii, Panama, the Philippines and Porto Rico see these titles).

Political Divisions. The republic politically consists of states, territories and districts and of dependencies or possessions. The states number 46, the territories three, the districts two. The possessions comprise Guantanamo Naval Station, Guam, the Panama zone, the Philippines, Porto Rico, three of the Samoan islands and many islets in the Pacific. The states include 13 that originated in English colonization, six that came into the Union without ever having been territories and 27 that had been territories. The present territories are Arizona, Hawaii and New Mexico; the districts Alaska and Columbia; the states

Alabama	Nebraska
Arkansas	Nevada
California	New Hampshire
Colorado	New Jersey
Connecticut	New York
Delaware	North Carolina
Florida	North Dakota
Georgia	Ohio
Idaho	Oklahoma
Illinois	Oregon
Indiana	Pennsylvania
Iowa	Rhode Island
Kansas	South Carolina
Kentucky	South Dakota
Louisiana	Tennessee
Maine	Texas
Maryland	Utah
Massachusetts	Vermont
Michigan	Virginia
Minnesota	Washington
Mississippi	West Virginia
Missouri	Wisconsin
Montana	Wyoming.

(See article on each)

Finance and Law

Though Congress is empowered by the constitution "to lay and collect taxes, duties, imports and excises," it imposes direct taxes only in war or in other exceptional circumstances. The national government derives its revenue almost entirely from duties on imports (see Tariff and Taxes) and from taxes on spirituous liquors, tobacco and other manufactures — especially on luxuries. In 1906-7 customs yielded $332,233,363; internal revenue $269,666,773; coinage $9,095,044; public lands $7,878,811; the District of Columbia $6,266,396; Indian lands $5,717,369; the Central Pacific Railroad $5,374,036; and fees $5,192,315. The civil service (Congress, courts, the executive and the departments and the District of Columbia) cost $180,244,532; pensions $139,309,514; the army (including improvement of rivers and harbors) $122,576,465; the navy $97,128,469; and the Indians $15,163,609. (See Army, Banks, Coinage, Consuls, National Debt, Navy, Patent-Office and Post-Office.) The revenues of the states, in distinction from the nation, come from direct taxation, and in the main are collected and spent by local authorities.

The legal system of the United States is based on English law. Weights and measures also are English, but the use of the metric system is legalized. (See Corporations, Currency, Law, Metric System and Weights and Measures.)

Defence

This is entrusted to a small army (called the regular army) and a navy and to a militia and a naval reserve. (See Army, Coast-Defence, Military Schools, Militia, Naval Academy, Naval Reserve, Navy and West Point). The United States is the only important power, except England, that relies for defence on a purely volunteer army. In addition to the regulars there are 6,000 native troops in Porto Rico and the Philippines and 75 Indian scouts. The militia is partly organized, partly unorganized. The organized militia called the national guard, belongs, not to the nation, but to the states. It numbers about 105,000 men. The unorganized militia, called the reserve, comprises males, with some exemptions, between 18 and 45, and is estimated to number over 16,000,000. The president can call both into national service, the former for nine months, the latter for two years.

Education and Religion

The constitution of the Union and the constitutions of the states guarantee the free exercise of *religion*, except where it opposes the constitution, and nowhere is there an established or state church. Every religion is represented -- Buddhism, Confucianism, Islam and others as well as Christianity. In 1907 there were 32,138,051 communicants in the Christian churches; 207,405 organizations; and 159,202 ministers. The Catholics (*of all bodies*) numbered 11,143,455 communicants.

(The Roman church numbered 10,879,930). The Methodists were the largest Evangelical body, all their branches together numbering 6,551,891 communicants. The Baptists came next (5,740,770), and Lutherans (1,957,433) and Presbyterians (1,771,877) contested the third place. Protestant churches are 17 times as numerous as Roman Catholic ones; their ministers 11 times as numerous; and their communicants more than double those of the latter. The Evangelical Sunday-schools (*q. v.*) numbered 140,519 in 1905; their teachers 1,451,855; and their pupils 11,329,253. The Roman Catholic clergy estimate their Sunday-school scholars as 1,000,000. The Jews (*q. v.*) have 143,000 communicants; 570 churches; and 301 ministers.

Education is the business of the states, not of the nation, and every state has by law established free, public schools. These are largely supplemented by private and parochial schools. In 1900 only 10.7% of the 58,000,000 Americans ten years old or more were unable to read or write. These illiterates numbered 6,180,069. Only 4.6% of the native white population ten years old and more was illiterate; but 12.9% of the same class of foreign-born whites and 44.5% of that class of the colored population were illiterate. That is, among the 41,236,662 of the first division there were only 1,913,611 illiterates; but among the 10,014,256 of the second class there were 1,287,135 illiterates and among the 6,698,906 of the third group there were 2,979,323 illiterates. Illiteracy in the United States is almost wholly due to ignorant immigrants and to ignorant negroes. But the percentage of illiteracy is falling with remarkable rapidity, for in 1880 it was 17% and in 1890 it was 13.3%. The United States leads the world in many industries, but in none does it lead more successfully than in the making of citizens in its public schools. Though the national government administers no system of education nor appropriates money directly for schools, it has ever since 1787 indirectly assisted education more generously than any other government that ever existed. In each new state it has set two square miles of each township six miles square aside as endowments for schools, agricultural colleges or universities. The total has been 75,000,000 acres for schools and universities, including 8,000,000 for colleges of agriculture. It also maintains a bureau of education (see DEPARTMENT OF THE INTERIOR), which collects statistics and publishes reports. The state systems of education are so similar that in effect they make a national system of American education. In 1905-6 there were 16,641,970 children in the public schools, which cost $307,765,659. The total number of pupils in *all* institutions is 18,434,847. Universities and colleges numbered 493, of which 335 were coëducational and 158 for men only. There also were 129 colleges for women. The colleges and universities had 130,078 students and 55,000,000 volumes in their libraries. The professional schools unconnected with colleges include those of dentistry (56), law (98), medicine (152), pharmacy (166), theology (150) and veterinary science (12), and number 60,000 students.

As for schools of music or art, almost every city has at least one. See COLLEGES, EDUCATION (MODERN), EDUCATION (STATE-AID), SCHOOLS and UNIVERSITIES; articles on other educational topics; and articles on the states and on single universities or colleges.

ART AND LITERATURE

See FINE ARTS, LITERATURE (AMERICAN) and SCULPTURE.

PEOPLE AND IMMIGRATION

The population in 1900 was 76,303,387, and in 1907 was double that of 1880. In 1907 it was estimated by the government officials as 86,429,000. In 1908 the governors of the states estimated it as 88,912,058 for the continental United States. Including the islands, it is 98,000,000. The original inhabitants were Indians (*q. v.*) of whom there are 291,581. The negroes (*q. v.*) were brought into the country in 1619 as slaves (see SLAVERY), and number over 10,000,000. Their progress since 1865 has been noteworthy. The native population of the continental United States in 1900 was 65,729,150, and the foreign-born 10,356,644. There were 160 cities of 25,000 or more inhabitants, their combined population being 19,718,312. The total urban population was 28,411,698, almost a third of the total. In 1906 there were 42 cities with populations of 100,000 or more and 48 with 50,000 to 100,000 inhabitants. Among these chief cities are New York, Chicago, Philadelphia, St. Louis, Boston, Baltimore, Pittsburg (including Allegheny), Cleveland, Buffalo, San Francisco, Detroit, Cincinnati, Milwaukee, New Orleans, Washington, Newark, Minneapolis, Jersey City, Louisville, Indianapolis, St. Paul and Providence — all, except San Francisco, east of the Mississippi and having from 4,113,043 inhabitants down to 203,243 or a total of over 12,500,000. (See articles on cities of the United States, as ADAMS or ZANESVILLE). The foreign-born population is 10,460,085, representing almost every known nationality, 26,918,107 immigrants having come between 1787 and July 1st of 1908. (Canadian and Mexican immigrants are not included). Before 1775 the English and Scotch-Irish were the prevailing race, though New York had a considerable Dutch and Pennsylvania a large German population, while South Carolina had many citizens of French descent. (The Louisiana of 1803 and Texas

and the southwest and California after 1848 added many French and Spanish inhabitants to the United States.) After 1820 immigration began to be considerable, the British predominating. In the 40's and 50's the Irish immigration first and then the German immigration assumed enormous proportions, the Irish settling chiefly in the eastern cities, the Germans on the western prairies. In the 70's the Scandinavian immigration became large, Maine, Minnesota and Wisconsin gaining many farmers from the storied Northland of Europe, and since 1890 Hungary, Italy, Poland and Russia have poured their millions in. In 1906-7, of 1,285,349 immigrants 338,452 or over a third came from Austria-Hungary; 285,731 were Italians; and 258,943 Russians (chiefly Jews). But in 1907-8 only 782,870 immigrants entered. Chinese are the only people excluded as a nation, though Japanese immigration is restricted, but all persons likely to become a public charge are also excluded by act of Congress (1882). In 1885 and 1903 more drastic laws were enacted, that of 1885 being later modified and in 1891 extended. (See CHINESE EXCLUSION and EMIGRATION.)

HISTORY

The story of our country naturally falls into three parts. These are the colonial period, the revolutionary epoch and the era of union. The first extends from 1576 to 1763; the second to 1789; and the third to the present day. But the first overlaps the second, because the revolution began while the United States was colonies; and the third runs back into the second, because American nationality and federal union began in revolution. Only the briefest account of American history can here be attempted. So it is suggested to the student, who wants to inform himself more fully, that he not only consult the articles named at the end of each paragraph but see articles on all the men and places and events mentioned within each paragraph itself.

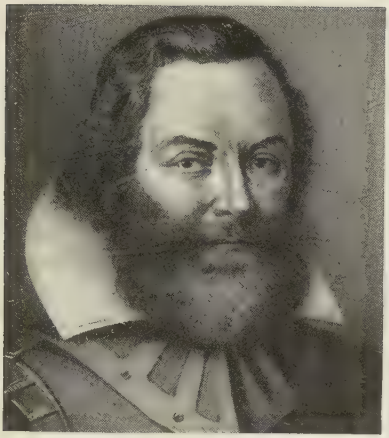
The Colonial Period. This is marked by colonization (1576–1750), by a struggle for expansion (1750–63) and by attempts at union (1763–75). English colonization began in 1585, when Raleigh planted settlements in North Carolina, and in 1602, when Gosnold placed colonists on islands off Massachusetts. It ended in 1733, when Oglethorpe founded Georgia. Permanent settlement came in 1607 in Virginia; in 1612 (by the Dutch) in New York; in 1616 in Maine; and in 1620 in Massachusetts. New Hampshire (1623); Maryland (1634); Connecticut and Rhode Island (1636); Delaware (1638, by Sweden); New Jersey (in 1640 by Swedes, before 1650 by Dutch and in 1664 by Englishmen); North Carolina (by Virginians before 1650, by English colonists in 1663); South Carolina (1670); and Pennsylvania (1661, though Swedes had founded settlements there in 1627 and Englishmen in 1641) successively became permanently settled. The separate histories of these colonies are given in articles under titles as above. They were governed by charters to the colonists or by proprietors or by the king, but all in effect were representative democracies. Life had all the hardships of existence in any new country, and these were increased by the difficulties of communication The southern planters, however, enjoyed a luxury that the middle colonies and New England could not then have. Nevertheless, as early as 1760 material prosperity abounded everywhere. In New England education was general; in the central colonies special classes had good education; and in the south the better class received education of a high order. Six colleges — Harvard, William and Mary, Yale, Princeton, Pennsylvania and King's (now Columbia) — were founded before 1760. Religious freedom prevailed to an exceptional extent. Thirteen governments (Maine being included in Massachusetts and Vermont in New Hampshire and New York) stretched from French Canada to Spanish Florida and from the Atlantic into the Appalachians. Their people numbered 1,250,000; had tamed the wilderness; had survived many struggles with the Indians; and were beginning to swarm across the mountains into the fertile valleys of the west. They were not unaware of their power. In 1690 and in 1710 New England had captured Port Royal, Nova Scotia, from France, and in 1745 it took Louisbourg, the strongest of American fortresses, on Cape Breton Island. But the colonists feared France in Canada (*q. v.*) and the French alliance with the Indians of the west. In 1749–54 came the crisis in the conflict for the continent, when the Virginians entered the Ohio Valley at Pittsburgh and Washington (1755) fought with and surrendered to the French. (See FRENCH AND INDIAN WAR.) In 1763 France ceded its American possessions (except New Orleans) from the Mexican Gulf to the Arctic Ocean and from the Appalachians to the Mississippi to Great Britain. It also ceded the Louisiana country between the Mississippi and the Rockies to Spain. So the colonists made good their claim to the eastern half of the Mississippi Valley, and cleared the way for the march of the Americans of the 19th century from the Atlantic to the Pacific. The French and Indian War showed the colonies their full strength, trained the soldiers and generals of the War for Independence and first united all the colonies. But its last result was to kill all sense of dependence on England. (See ALBANY CONGRESS; ANDROS; BACON, NAT.; BALTIMORE, LORD; BERKELEY, WM.; BLUE LAWS; BOONE, DAN.;

Braddock, Ed.; Carteret, Geo.; Claiborne, Wm.; Colleges; Culpeper; Delaware, Lord; Endicott; Gosnold; Indians; Jamestown; Louisbourg; La Salle; Penn; Pilgrims; Pontiac; Puritans; Raleigh, Sir W.; Smith, Capt., of Virginia; and Seven Years' War.

The Revolutionary Epoch. The English government, to repay the expenses of the war with France, taxed the American colonies heavily. Since 1651 it had hampered their commerce and manufactures, and Parliament's legislation was one of the direct causes of the American Revolution, but acts in restraint of trade were not vigorously and universally enforced until 1761. The colonists acknowledged that it was only fair that they should pay their share of the cost of their protection by England, but denied that Parliament, in which they were not represented, had the right to tax them. In 1761 Otis of Massachusetts declared that "an act of Parliament against the constitution is void," and the colonists resisted Parliament's writs of assistance.

In 1765 Parliament passed a stamp-act that taxed the colonists without their consent, devoted the American revenue to the support of a standing army, and intended this army to maintain taxation. The Virginian assembly, the people's house of the legislature, declared that each colony had the right to make its laws and to lay and spend the taxes; the Massachusetts assembly proposed an American congress of representatives from every colony, appointing a committee to secure united action. The congress met, and appealed to the king and Parliament. The stamp-act (*q. v.*) was repealed, but American imports were taxed (1767) and the British authorities goaded the colonists further and further. In 1773 the colonial legislatures appointed "committees of correspondence" to keep up union of action with one another. A national spirit had been born. When the people of Boston threw a cargo of tea into the water, "the whole continent applauded." In 1774 Boston was closed to commerce and the charter of Massachusetts changed. These acts of the British government made war only a question of time. They crystallized every element of union in the colonies. The Virginians suggested, and the men of Massachusetts called, another congress which met at Philadelphia in September of 1774. This was the first continental congress (*q. v.*), the first really national body in American history. It addressed the English people and the king, and issued a Declaration of Rights of the colonists. It approved Massachusetts' opposition to Parliament and resolved that, if execution of the acts "*by force* "should be attempted, "all America ought to support their opposition." Congress summoned a new Congress which convened at Philadelphia in May of 1775. The British government now ordered General Gage to reduce the colonies to submission, and he at once took possession of Boston Neck and fortified it.

On April 19, 1775, at Concord and Lexington, Mass., war began, and with it the national existence, politically, of the United States. The people's or lower house of every colony took the government. Congress met as the representative of an united people, and all the colonists supported Massachusetts. The articles of association had already substituted government by the people for government by the legislatures, and the general union affected all our after history. Congress was sustained by the united people without regard to colonial governments, but did not take the national powers that were within its grasp. Congress adopted the Massachusetts miltia around Boston as the nucleus of the national army, and Washington was appointed its commander-in-chief. The day of his being commissioned is the day of the battle of Bunker Hill, which was one of the decisive battles of the war, because it showed that American soldiers would stand their ground. In March of 1776 Washington compelled the British to quit Boston. The war was unpopular in England, the British fighting but half-heartedly till 1778. In June of 1776 Richard Henry Lee of Virginia moved that Congress declare independence, and in July it "resolved that these united colonies are and of right ought to be free and independent states; that they are absolved from all allegiance to the British crown; and that all political connection between them and Great Britain is and ought to be totally dissolved." On July 4 Jefferson's Declaration of Independence was adopted by Congress, and the United States' legal existence began. Meanwhile the war was going against the new nation, for Washington was driven out of Long Island, New York and New Jersey, and the British controlled the Hudson's mouth. But on Dec. 26, 1776, at Trenton, N. J., Washington struck the blow that proved the turning-point of the war, and on Jan. 4, 1777, he made Morristown, N. J., his headquarters, and there these really remained through almost all the rest of the war. De Kalb of Germany, Kosciusko of Poland and La Fayette of France already were serving in the American army; Pulaski and Steuben came later; and in 1777 Franklin in France made the government in all but name an ally of the United States. On Oct. 17, 1777, Burgoyne, a British general who had tried to cut off New England from the other colonies by coming down the Hudson from Canada, was forced to surrender his army at Saratoga. This success won the United States a treaty of alliance with France. Howe captured

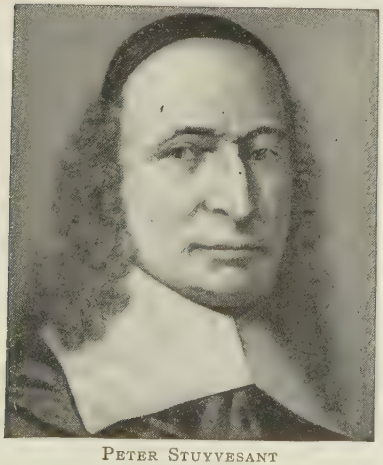


Captain John Smith

Pocahontas

John Winthrop

William Penn



Peter Stuyvesant

James Edward Oglethorpe

EMINENT CHARACTERS OF COLONIAL PERIOD

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Philadelphia, the capital, in 1777, and Washington, though he had made his army capable of taking the offensive, spent a terrible winter at Valley Forge, Pa. In the summer, however, of 1778 the end began. There were no more important events at the north, except unsuccessful attempts to recover Newport, R. I., Wayne's capture of Stony Point and Arnold's treason at West Point; for Washington at Morristown, N. J., watched New York and protected Philadelphia. In the winter of 1778–9 Clark of Kentucky, under the authority of Virginia, won the west for the United States. The English, hopeless of success in the north and east, transferred the war to the south, mistakenly imagining that the slaves would rise against their masters. In 1778 they captured Savannah and Georgia, in 1780 Charleston and South Carolina. But Greene, the only great American general developed by the war, except Washington, saved the south (1781), though never winning a battle, and he was ably seconded by Morgan, Marion and Sumter. The English held only Charleston, New York City and Savannah, and the country at large had long been at peace. In June of 1781 Cornwallis chose Yorktown, Va., as a permanent post on Chesapeake Bay. But Washington, watching Clinton at New York, had been reinforced by 6,000 French troops. A French fleet was to enter the Chesapeake. Washington deceived Clinton into thinking that he was to attack New York City. Clinton weakened Cornwallis by withdrawing part of his troops. Washington moved down the Hudson, kept Clinton in ignorance to the last moment, suddenly swung aside through New Jersey and Philadelphia, and hurried the allied armies down Chesapeake Bay. The French fleet had early in September driven off the British fleet supporting Cornwallis. The American and French armies invested his position in front, the French fleet his rear. Besieged and starved, the English fleet unable to reach him, he surrendered on Oct. 19, 1781. "My God!" cried Lord North, when the news reached him, throwing up his hands; "it is all over." It was. The moral effect of the capture of Cornwallis practically ended the fighting. On Nov. 30, 1782, Great Britain acknowledged the independence of the United States, and on Sept. 3, 1783, peace was definitively concluded. (See ADAMS, JOHN; ADAMS, SAM.; ANDRÉ; ARNOLD, BENEDICT; BUNKER HILL; BURGOYNE, JOHN; CINCINNATI, SOC. OF; CLARK, GEO. R.; CORNWALLIS; DANE, NATHAN; DAUGHTERS OF THE REVOLUTION; DECLARATION OF INDEPENDENCE; FRANKLIN, BEN.; GREENE, NAT.; HAMILTON, A.; JEFFERSON, THOS.; LEE, R. H.; MORRIS, ROB.; OTIS, JAMES; PAINE, THOS.; PARLIAMENT; SARATOGA; TRENTON; VALLEY FORGE; WASHINGTON, GEO.; and YORKTOWN.)

The United States, which had first called itself by that name in the Declaration of Independence, began with a territory bounded on the north nearly as now, on the west by the Mississippi to the latitude of Florida and on the south by (then Spanish) Florida. But the country, though a union, was a confederated union, not a federal union. For in 1775–6 the colonies, as soon as imminent danger disappeared, deprived Congress of so much power that they endangered the nation's life. The new legislatures took the power of naming and recalling the delegates to Congress; the thought of nationality grew dim; and the colonies asserted that they were sovereign states. In 1777 articles (*q. v.*) of confederation were adopted which made the new nation merely "a firm league of friendship" between sovereign states. Congress at best hardly had more than advisory power. The states were to be sovereign in everything. The result was inefficiency in the management of public affairs. So, in 1787, "we, the people of the United States, in order to form a more perfect union" held a constitutional convention which met at Philadelphia. This was the ablest body that had assembled since 1775, and Washington presided. It formed the present constitution (which has already been described), nine states adopted it by June of 1788, and the new government began. This is the federal union, in which the people are the sovereign. New York was made the capital, Washington elected president unanimously and John Adams made vice-president (1789).

In 1787, too, the continental Congress had passed an ordinance, the famous Ordinance (*q. v.*) of 1787, in regard to the new lands of the United States between the states and the Mississippi, the states having ceded their lands there to the United States. These lands played no small part in bringing about the federal union, and the ordinance proved of immense importance to the future of the United States and to its politics.

It is difficult to realize how poor and weak our country was. It owed $42,000,000, but numbered only 3,929,214 people. It was an almost exclusively agricultural country. Communication was slow and painful. Distances were immense when there were neither railroads nor steamships, and this increased the labor of administering such a country under a single government. The states were jealous of one another and of the Union. The people themselves had changed since 1775, and not for the better. The things that saved the nation were the picked men that led it and created a strong government; the keen and intelligent interest of its citizens in politics; and the outlet to the new domain in the west. The states yielded their claims here to the Union, free

navigation of the Mississippi was secured from Spain (1795), and emigration began to flow freely across the Alleghanies. The Federalist party controlled the first two Congresses, and organized the government much as it is to-day. Protection of American manufactures was begun, the national debt funded, the debts of the states being assumed as part of it, a national bank founded, and Washington City appointed to be the capital after 1800. John Adams was elected president and Thomas Jefferson vice-president in 1797. But the Federal party passed three laws about aliens and sedition that the Anti-Federalists (then called Republicans, but Democrats now) considered political persecution. In 1801 the Anti-Federalists came into power in the election of Thomas Jefferson as president. (See ALIEN AND SEDITION LAWS; HABEAS CORPUS; HISTORY; INDIANS; INTERNATIONAL LAW; JAY, JOHN; JURY, TRIAL BY; LANDS; MINT; MONEY; NATURALIZATION; NAVIGATION LAWS; NEUTRALITY; POLITICAL ECONOMY; POLITICAL PARTIES; POOR LAWS; PRESIDENT; PRESS, FREEDOM OF; PROTECTION; SUFFRAGE; TARIFF; TAXES; and WHITE HOUSE).

Meanwhile Vermont (1791), Kentucky (1792) and Tennessee (1796) had become states. Whitney (1793) had invented the cotton-gin, which made cotton-growing profitable and slave-labor apparently necessary, and so played a part in politics. "The West" had begun to be a factor in our growth, for the Indians of Ohio had been compelled to surrender their lands and the safety with which settlement could be made gave it a new impetus. The rising spirit of migration inspired the people to try to improve the communications, and attempts were made to introduce turnpikes and canals. Our population (1800) had become 5,308,483.

Jefferson, though believing that the constitution should be interpreted narrowly and the powers of the national government severely restricted, was forced by events to do things that not even the Federalists had done. He doubted if the nation had the right to buy and hold territory, but in 1803 he bought the Louisiana country, thus more than doubling the area of the United States. He also sent Lewis and Clark to explore the Oregon country. In 1805 the Barbary pirates were reduced to submission. In 1807 an embargo act forbade foreign commerce altogether, in order to starve Great Britain into fair treatment of the United States. It injured American commerce greatly, but did nothing else; and the relations between England and the United States grew more and more strained. Ohio had become a state in 1803; Fulton had made steam a commercial success in navigation (1807), so that within four years steamers plowed the western rivers and emigration crossed the Mississippi; and the slave-trade was abolished (1808). (See EMBARGO ACT; LEWIS AND CLARK; and LOUISIANA PURCHASE).

Madison succeeded Jefferson in 1809, and tried to carry out Jefferson's policy, but in 1812 had to declare war against England. The United States could no longer tolerate the British claim of sovereignty over naturalized American citizens, the claim to the right to search the ships of neutrals, the claim of a right to impress her subjects as seamen, wherever found. On land the war was disastrous, as a whole, for America, though the battles of Chippewa, Lundy's Lane and New Orleans were American victories; but at sea and on the lakes it was successful, the United States winning 15 out of 18 engagements. Peace was renewed on Dec. 24, 1814. Nothing was said about search and impressment, but Britain never again searched American ships or impressed American seamen. The war strengthened the national government and took the Democratic party to many of the positions of the Federalists. The supreme court, John Marshall of Virginia being chief-justice (1801–35), also took advanced positions in favor of the federal government. Protection to American industries was renewed, and inventive genius grew rapidly. By 1810 our population had grown to 7,239,881. Louisiana had become a state in 1812. (See EMIGRATION; HARTFORD CONVENTION; MARSHALL, JOHN; and TECUMSEH).

Madison was in 1817 succeeded by Monroe, and the old Democratic party became two parties (1825). Clay was the leader of the new Democracy, which called itself Whigs and took in the remains of the Federal party; Calhoun and Jackson of the party which now formally called itself the Democratic party. The westward movement of population was growing more and more, and Indiana, Mississippi, Illinois, Alabama, Maine and Missouri all joined the Union during 1816–21. The population (1820) had become 9,638,453. All our territory east of the Mississippi (except the northern part of the old northwest) had become states, Florida had been bought from Spain, and the Indians between Georgia and the Mississippi had ceded their lands and left this territory open for settlement. Commerce between the east and the west was facilitated in 1825 by the completion of the Erie Canal. In 1823 Monroe promulgated the Monroe doctrine.

John Quincy Adams (*q. v.*) in 1825 followed Monroe, being elected as a National Republican. He upheld the system of internal improvements and of protection to manufactures, the tariff of 1828 being extremely protectionist. (See ERA OF GOOD FEELING; MISSOURI; SLAVERY; and WHIGS).

Jackson became president in 1829. Cal-

houn of South Carolina held that any state, if it considered a law of Congress unconstitutional, might suspend or nullify it. South Carolina declared the tariff of 1832 null, but Jackson compelled it to repeal the ordinance of nullification. He also deprived the United States Bank of the public funds. During 1829–37 all the machinery of American political parties came into being. In 1826 the railroads had begun and they made the growth of the west far more speedy. Our population in 1830 was 12,866,020. Anthracite was now at last used with commercial success. Steam navigation across the Atlantic was established (1838), the telegraph came in 1844, and the modern era of the United States opened. In 1835 the public debt was extinguished, and the surplus distributed among the states. In 1837 came a serious financial panic. (See BLACK HAWK; CALHOUN, JOHN C.; CLAY, HENRY; CROCKETT, DAVY; HAYNE, R. Y.; HOUSTON, SAM.; JACKSON, ANDREW; JOURNALISM; KENT. JAMES; NEWSPAPERS; SOUTH CAROLINA; SATES' RIGHTS; TEXAS; STORY, JOS.; and WEBSTER, DANIEL.)

Van Buren succeeded Jackson in 1837, and replaced the national bank by the government treasury, but the hard times enabled the Whigs to elect William Henry Harrison. As he died soon after his inauguration (1841), Vice-President Tyler became president, and the Democrats rather than the Whigs ruled. They then elected Polk (1845–9) and Texas was annexed in 1845. War with Mexico followed (1846–8), America took possession of California and New Mexico, and Taylor and Scott won every battle with the Mexicans. Peace was concluded in 1848, Mexico ceding what now are Arizona, California, New Mexico, Nevada and Utah. The United States paid Mexico $15,000,000 and assumed $3,000,000 of Mexican debts to American citizens. At the same time (1844–6) the United States obtained the Oregon country (between the Rockies, Canada, the Pacific and California, Nevada and Utah) from England. Texan annexation had added 375,000 square miles to the country, the Mexican cession 500,000 and the Oregon country about 250,000. The United States, when the Gadsden purchase (1853) rectified the frontier between Mexico and New Mexico, had taken the dimensions it retained till 1867. (See CALIFORNIA; COMPROMISE OF 1850; FUGITIVE SLAVE LAW; GADSDEN PURCHASE; MEXICAN WAR; MEXICO; MORMONS; OMNIBUS BILL; and UTAH.)

But the discovery of gold in California (1848) and the non-existence of slavery in the Mexican lands brought political troubles. The Missouri compromise (1820) had prohibited slavery (except in Missouri) in the Louisiana country north of 36° 30′. Agitators at the north at once opened public opposition to slavery, and in 1831 a movement for the abolition of it began. (See EMANCIPATION, GARRISON and PHILLIPS.) In 1820 the south and the north had already drifted apart in their views as to slavery, state sovereignty and the Union. New economic conditions controlled the north and the west, which the south hardly felt, and these widened the gulf between the sections. California applied for admission as a state, and forbade slavery. If it and other states from the new territory were to be free states, the slave-states would lose power and slavery would be endangered. In 1850 California was admitted as a free state, but a fugitive-slave law was passed.

Since 1830 material development had been extraordinary. The sudden increase of wealth gave fresh impetus to the spirit of invention. Goodyear's method of vulcanizing rubber (1839) came into universal use. McCormick invented the reaper (1834), which has been hardly less important to the country than the railroad, enabling it to fill the west rapidly and making western farms profitable. In 1846 came the power-loom, a successful sewing-machine and the surgical use of anesthetics. Next year brought the rotary press for printing. In 1847, too, European immigration first became an important factor in the making of the country. Its population in 1840 was 17,069,453. In 1850 it had become 23,191,876.

The Whigs elected Taylor (1849), who, however, died in September of 1850 and was succeeded by Fillmore. The Democratic party had put forward the doctrine of squatter sovereignty or the proposal that the people of each territory be left to settle the question of slavery for themselves. The Whigs had ignored or evaded the problem. In 1854 Kansas and Nebraska were organized as territories, both being in territory where the Missouri compromise had prohibited slavery. The compromise was now repealed, and the question of slavery was left to the people of these territories. The south and the north vied to see whether these people should be southerners and favor slavery, or northerners and favor freedom. Civil war in Kansas ensued, but the antislavery settlers were in a large majority and Kansas finally (1861) became a free state. Meanwhile a new party, an antislavery party only so far as it aimed to exclude slavery from the national territory, had arisen and had captured the popular branch of Congress. The Democratic party, which since 1852 had practically been the sole party, was faced by the Republican party. (See CHASE, SALMON P.; DAVIS, JEFFERSON; DOUGLAS, S. A.; KANSAS; LINCOLN, ABRAHAM; SEWARD, WM. H.; STANTON, E. M.; SUMNER, CHAS.; and UNDERGROUND RAILROAD.)

The Democrats had elected Franklin

Pierce (1853) and in 1857 James Buchanan, another Democratic president, succeeded him. In 1857 Chief-Justice Taney of the Supreme Court decided that the national constitution considered slaves, not persons, but property; that the Missouri compromise had been unconstitutional; that Congress was bound to protect property; and that Congress, therefore, ought to and must protect slavery in the national territory. The south maintained that its view as to the duty of Congress was confirmed, the north flouted the decision (the Dred Scott decision), and disunion came in sight. But the south and the north had so diverged in population, resources and wealth, that in 1860 the free states were 19,000,000 to the slave states' 12,000,000. (The total population was 31,443,321.) The Democratic party split in 1860, the northern or Douglas Democrats resting on squatter sovereignty and the compromise of 1850, but willing to accept the decision of the Supreme Court, the southern Democrats demanding protection from Congress for slavery in the territories. The Republicans demanded that Congress prohibit slavery in the national domain. Abraham Lincoln, their candidate, was elected. South Carolina on Dec. 20, 1860, seceded and prepared for war, and by Feb. 1, 1861, had been followed by Mississippi, Florida, Alabama, Georgia, Louisiana and Texas. On Feb. 4 they formed the Confederate States. In the spring North Carolina, Arkansas, Virginia and Tennessee joined the Confederacy. On April 14, 1861, South Carolina attacked Fort Sumter, and the Civil War began. It closed on April 9, 1865, at Appomattox, Va. It had engaged 2,780,000 Federal and 1,000,000 Confederate troops; cost 500,000 lives; encumbered the nation with a debt of $2,800,000,000; and almost ruined the south.

For details of this bitter and exhausting struggle the reader is referred to accounts (under proper titles) of the important battles, as Bull Run, Donelson, Shiloh, Stone River, Antietam, Fredericksburg, Gettysburg, Vicksburg, Chickamauga, the Wilderness, Spottsylvania, Mission Ridge and Atlanta, as, also, to sketches of the great leaders, as Lincoln, Grant, Sherman, Thomas, Sheridan, Logan and others of the Federal side and Davis, Lee, Beauregard, Johnston, Jackson and others of the Confederates. It should be noted, however, that, while the final issue was determined in the results of these great battles, any adequate understanding of the intensity and strain of this titanic struggle must be sought in the story of hundreds of minor engagements, for the record shows that during 1862–4 every day saw a clash of arms, and it is a literal fact that the roar of artillery and the rattle of musketry did not cease for one day during these dreadful years. (See CONFEDERATE STATES; DECORATION DAY; DRAFT RIOTS; EMANCIPATION PROCLAMATION; JOHNSON, ANDREW; KUKLUX KLAN; NEGRO EDUCATION; PEACE SOCIETIES; RECONSTRUCTION, REPUBLIC, GRAND ARMY OF THE; and THANKSGIVING DAY).

Reconstruction ensued, and on Jan. 30, 1871, the last of the seceding states was recognized and reinstated by Congress. On Jan. 1, 1863, the proclamation of emancipation from slavery had been issued; in 1865 the thirteenth amendment to the constitution abolished it forever; and in 1870 the fifteenth amendment was adopted, which provided that "the right of citizens of the United States to vote shall not be denied or abridged by the United States or by any state on account of race, color or previous condition of servitude." By 1897 the debt, in spite of enormous pensions yearly to survivors from the Federal forces, had been reduced nearly half. In 1867 Alaska had been purchased from Russia and France had been compelled to withdraw from Mexico, which was thus enabled to overthrow Maximilian.

Andrew Johnson, who had been made president by Lincoln's death, was succeeded in 1869 by General Grant. During his administration the *Alabama* claims against England were settled by arbitration in favor of the United States, the Union and Central Pacific Railroads were completed, the civil service was reformed, the panic of 1873 occurred, and the centenary of the independence of the United States was celebrated by an international exposition. In 1870 the population had grown to 38,558,371. (See ALABAMA CLAIMS; ARBITRATION; EXPOSITIONS; LABOR; LABOR PARTIES; PEONAGE; RED CROSS SOCIETIES; SPECIE PAYMENTS; and WOMAN'S RIGHTS.)

In 1877 Rutherford B. Hayes was inaugurated president. He immediately withdrew the last Federal troops from the south, and the government of the southern states by the negroes and by northern office-holders ceased. Specie-payments were resumed. James A. Garfield succeeded him in 1881, but was assassinated, Vice-President Chester A. Arthur succeeding to the presidency. Chinese immigration and polygamy were prohibited. By 1880 the population had become 50,155,783.

The Democratic party came into power again in 1885, when Grover Cleveland became president. He extended the reform of the civil service to a great number of offices, and urged radical changes in the tariff. Another antipolygamy law and another bill for the exclusion of the Chinese were passed. The succession to the presidency was regulated, as was also interstate commerce. (See IMMIGRATION BUREAU; INHERITANCE TAX; INTERSTATE COMMERCE; RECIPROCITY; SINGLE TAX; STRIKES; and TRADE-UNIONS.)

The Republicans elected Benjamin Harrison (1889-92) as Cleveland's successor. Commercial and political relations with Central and South America were strengthened and extended, as was the policy of reciprocity, though a high tariff was enacted. The pension system was enlarged, the law for free coinage of silver repealed and another for limited coinage substituted. A revolution occurred in Hawaii, the native monarchy was overthrown, and the new government applied for annexation to the United States. Congress passed a bill for the annexation of Hawaii, but Cleveland was elected again, and annexation did not occur until 1898. In 1890 our people numbered 62,947,714. (See HAWAII; and INCOME TAX.)

Cleveland's second term opened with the financial panic of 1893, the establishment of a low tariff and efforts to restore Hawaii to its native rulers. A dispute between Great Britain and Venezuela was settled at the instance of the United States by referring it to a tribunal of arbitration. The fourth centenary of the discovery of America was celebrated by the Columbian Exposition. The difficulty with England and Canada as to sealing in Bering Sea was settled amicably. The president extended the reform of the civil service, and used Federal troops to suppress a strike that interfered with interstate commerce.

The Republican party returned to power by the election and reëlection of William McKinley (1897–1901) and the succeeding elections of Theodore Roosevelt (1904) and William Howard Taft (1908). The political and financial question in 1896 was whether the United States should adopt gold alone or gold and silver as its monetary standard, and in 1900 gold was by law established as the standard of currency. A high tariff was also restored. In 1898 war with Spain broke out, and resulted in the acquisition of Porto Rico and the Philippines (*q. v.*). In 1900 the United States joined the powers of Europe in suppressing a rebellion in China. On Sept. 6, 1901, President McKinley was assassinated, and Vice-President Roosevelt (*q. v.*) became president. The eight years of his presidency were marked by great prosperity and expansion and by the advance of the nation to commanding position as a world-power. Among important affairs demanding the attention of Congress and the executive were the building of Panama Canal (*q. v.*); the reclamation of great areas of arid lands by irrigation (*q. v.*); the husbanding of the national resources through the cultivation of forests and the establishment of forest-reserves (*q. v.*); the promotion of the welfare of the Filipino; the occupancy of Cuba (*q. v.*) and the reëstablishment of its republic; the righting of abuses in the management of railroads and other great corporations; the completion of the Pacific cable; commercial treaties with Cuba and China; the creation of the Department of Commerce and Labor; the signing of a treaty of arbitration with Germany; the second peace-conference at The Hague (*q. v.*); financial control of Santo Domingo; the foundation of an American institute for the promotion of industrial peace between capital and labor; and the Pan-American Congress. In November of 1908 an important agreement was signed by the United States and Japan, in which it was declared that their mutual rights and interests shall be respected, thus assuring peace between them, and that the integrity of China and an open door in commercial relations with it shall be maintained. The south has emerged from its isolation, and entered a new era of prosperity, freed from the slavery that cursed the white man even more than the black man. It has wonderfully developed its mineral resources, grows three times as much cotton as in 1860, and is promoting all other industries.

BOOKS FOR READING

Colonial Period (*to* 1760). Among general histories, which cover not only this period but others or the whole course of American history, the student should consult The American Commonwealth Series and the works of Bancroft, Bryant and Gay, Gilman, Higginson, Hildreth, McMaster, Rhodes, Schouler, Von Holst and Winsor. Histories that deal specially with the colonies consist, among others, of Dodge's *English Colonies*, Doyle's *English Colonies*, John Fiske's works (named in the article on Fiske), Lodge's *English Colonies*, Marshall's *History of the Colonies*, Neill's *English Colonization*, Palfrey's *History of New England* and Parkman's works. The articles in this work on the separate states of the Union often mention books of reference. Nor should American chapters in *The Cambridge Modern History* be forgotten.

Revolutionary Era (*to* 1789). Channing and Hart's *Guide to the Study of American History* is helpful to start the study of the Revolution. Other helps are Fiske's *American Revolution* and *Critical Period of American History;* Carrington's *Battles of the Revolution;* Chalmers' *Revolt of the Colonies;* Dunning's *Political Theories;* Frothingham's *Rise of the Republic;* Hamilton's *Federalist;* Ludlow's *War of Independence;* Merriam's *American Theories;* Scott's *Constitutional Liberty;* Story's *Commentaries;* Sullivan's *Antecedents of the Declaration;* Willoughby's *Nature of the State;* and Winsor's *Reader's Handbook*. Lecky's *History of England* and Trevelyan's *American Revolution* give the English views.

The National Era (*to date*). Consult Bancroft (Geo.): *History of the Constitution;* Bancroft (H. H.): *The Pacific States;* Ben-

ton: *Thirty Years' View;* Blaine: *Twenty Years of Congress;* Bryce: *The American Commonwealth* (student's edition); Curtis: *History of the Constitution;* Davis, Jefferson: *The Rise of the Confederate Government;* Ely: *The Labor Movement;* Fiske: *American Political Ideas;* Foster: *A Century of American Diplomacy;* Hart: *Foundations of American Foreign Policy;* Jameson: *The Constitutional Convention;* Johnston (A.): *American Politics;* Kent: *Commentaries;* Lamphere: *American Government;* Macy: *Civil Government, Institutional Beginnings, Our Government* and *Political Parties;* Morse: *Citizenship;* Richardson: *Messages and Papers of the Presidents;* Roosevelt: *Naval History* and *The Winning of the West;* Stephens, A. C.: *The War Between the States;* Taussig: *Protection;* The Century Co.: *Battles and Leaders of the Civil War;* and Wilson, H. H.: *The Rise and Fall of the Slave-Power.* The American Statesmen Series also should be consulted; the writings of public men, as Grant or Washington; and public or official documents as well as such statistical works of private individuals as *The Statesman's Year-Book.* FREDERIC PERRY NOBLE.

Uni'ted States, Depart'ments of. There are nine departments of the executive branch of the government of the United States, of which the president is the head. The heads of the departments, known as secretaries, are appointed by the president, subject to confirmation by the senate. The continental congress had established a post-office department before July 4, 1776, and afterwards established departments of foreign affairs, of the treasury and of war. The secretaries have a salary of $12,000 a year each, but no seats in Congress, and form the president's cabinet or board of advisers. The heads of the departments are the secretary of state, secretary of the treasury, secretary of war, secretary of the navy, secretary of the interior, secretary of agriculture, secretary of commerce and labor, postmaster-general and attorney-general.

Department of State. The department of state, first called the department of foreign affairs, has charge of all the relations and business of the United States with foreign nations. The divisions or bureaus as they are called are the diplomatic bureau, consular bureau, bureaus of statistics, accounts, archives, library, trade, appointments and passports. There are four classes of ministers sent to foreign countries to represent the United States: ambassadors extraordinary, ministers plenipotentiary, ministers resident and *chargés d'affaires* (persons in charge of affairs). In the principal foreign cities are stationed consuls (*q. v.*) or governmental agents, who look after the interests of Americans, residents or travelers, and especially American seamen. The principal officers of the department of state, besides the secretary, are three assistant-secretaries, eight heads of bureaus, one solicitor, two assistant-solicitors and one chief clerk. (See NATURALIZATION.)

Treasury Department. The largest and most important department is that of the treasury, which was formed in 1789. The secretary of the treasury has to superintend the collection of revenue, to grant warrants for money used in carrying out the appropriations of Congress, to oversee the public debt, national banks, coinage, internal revenue etc. There are three assistant-secretaries; eight division-chiefs; two comptrollers; a chief clerk; and six auditors. There also are a treasurer of the United States, who has charge of all public money and pays it out only on orders from the secretary of the treasury; an assistant-treasurer; a register of the treasury, who keeps the accounts; a deputy-register; a commissioner of internal revenue; a director of the mint, assisted by two deputies; a chief of the bureau of engraving; an actuary and a surgeon-general; the supervising architect; two solicitors; and a chief of secret service. The director of the mint holds his place for five years, and has charge of the mints and assay-offices. The chief of the bureau of engraving and printing has the oversight of the printing and engraving of all United States bonds, bank-notes etc. and the printing of all public documents, reports etc. The internal-revenue bureau has charge of the collecting of government taxes; the life-saving service has charge of the appliances for the saving of life and property on all our coasts; and the architect has charge of all building, repairs, construction etc. The bureaus of statistics and navigation, the coast-survey, steamboat-inspection etc. formerly belonging to the treasury department, were transferred to the department of commerce and labor when that department was established in 1903. Full reports are required of all the officers of the treasury. (See LIFE-SAVING SERVICE.)

The Department of War. The president is commander-in-chief of the army, but never acts in that capacity, and makes all communications to it through the secretary of war. The army is directly under the control of the secretary of war, with the aid of an assistant secretary and the chief-of-staff of the army. (See ARMY.) The war department, through its secretary, reports on the state of the army, the necessary expenses etc., and also has charge of the improvements of rivers and harbors. The military secretary has charge of the recruiting and mustering of soldiers and records of the army; the inspector-general examines arms and the drill and discipline of the army; the judge-advocate-general is in charge of the bureau of military justice;

and the signal-officer, in charge of the signal-service, which oversees the seacoast service; the quartermaster-general, with the duty of providing the army with supplies; the commissary-general, who sees to the rations or food of the army; the paymaster, who keeps accounts; and the surgeon-general are important officers of the department. There also are an ordnance department and an engineer corps, the chief of ordnance and the chief of engineers being very prominent and important officers. This department also has a bureau of insular affairs, a custodian of public buildings and a landscape-gardener, while every division or bureau named also has a head-clerk. (See QUARTERMASTER and SIGNAL-SERVICE.)

Department of the Navy. The navy has one admiral and 155 rear-admirals, 20 of whom are in service. The grade of commodore on the active list has been abolished from the navy. The navy department was not formed until 1798, and has eight bureaus of yards and docks, navigation, ordnance, construction and repairs, equipment and recruiting, provisions and clothing, steam engineering, medicine and surgery. The duties of the heads of these departments, three of whom rank as rear-admirals while in office, are similar to those of the war department, and are sufficiently indicated by the name of the bureau. (See NAVAL ACADEMY, NAVAL OBSERVATORY, NAVY and OBSERVATORY.)

The Postoffice Department. The postoffice department, permanently established in 1794, has, besides the postmaster-general, four assistant-postmasters, each with a corps of superintendents and assistants. The first assistant-postmaster has charge of the money-order system and the dead-letter office (*q. v.*), where all unclaimed mail is sent, the free delivery system and the location of new offices. The second assistant arranges the mail service, making contracts, furnishing bags, locks etc. The third assistant has charge of the making and distributing of stamps, postal cards, wrappers, the collection of revenue from postoffices and other financial operations. The fourth assistant has charge of post-office inspectors, receives applications for postmasters, issues their commissions, and investigates losses by mail. See POST-OFFICE.

The Department of the Interior. The department of the interior was formed in 1849, and has charge of public lands, Indians, pensions, patents, education, the census and geological survey. There are two assistant secretaries; a commissioner of public lands; a commissioner of pensions, with the oversight of 18 pension agencies; the commissioner of Indian affairs, with a board of ten commissioners and 70 agents; the commissioner of patents, of education and of the geological survey and the reclamation service. (See CENSUS, EDUCATION, GEOLOGICAL SURVEY, INDIANS, PATENTS, PENSIONS, SMITHSONIAN INSTITUTE, SURVEYING and TRADE-MARK.)

Department of Agriculture. The agricultural department, formed in 1889, has charge of experimental stations where new plants are tested, of the distribution of rare seeds and plants, the collection of statistics, the study of animal diseases and insect pests, weather observations etc. (See FOREST-SERVICE, NATIONAL PARKS and SIGNAL-SERVICE.)

The Department of Commerce and Labor. The department of commerce and labor was formed in 1903. It has charge of matters relating to the interests of commerce, trade, manufactures and labor; as also of the census, of statistics, of steamboat service, of navigation, of naturalization and of information about immigration. The bureaus of corporations and manufactures, the light-house board, the fish commission, the coast and geodetic survey, the bureau of standards, immigration and the reports of consular officials and of customs and revenue officials belong to this department. (See COAST-SURVEY, FISH-CULTURE, IMMIGRATION BUREAU and NAVIGATION LAWS.)

The Department of Justice. The attorney-general presides over the department of justice, as it is called, and has six assistant attorney-generals and a solicitor-general, with the charge of such law business of the country as conducting suits for the United States and overseeing the United States attorneys and United States marshals. It is distinct from the supreme court.

United States Names and Meanings.

NAME	ORIGIN AND MEANING	POPULAR NAME
Alabama	Indian name of a river meaning Here We Rest	Cotton State.
Arkansas	Indian name of a tribe meaning They Who Went down the River	Bear State.
California	Spanish for Hot Furnace	Golden State.
Colorado	Spanish for colored or red.	Centennial State.
Connecticut	Indian name meaning The Long River	Nutmeg State.
Delaware	English name of a nobleman.	Diamond State (or Little Blue Hen).
Florida	Spanish word meaning Flowery	Everglade State.
Georgia	Latin form meaning Land of (King) George.	Empire State of the South or Goober State.
Idaho	Indian name meaning Mountain-Gem.	Gem of the Mountains.
Illinois	Indian name of a tribe, meaning The Men.	Prairie State.
Indiana	Latin form, meaning Land of Indians.	Hoosier State.
Iowa	Indian name of a tribe and a river.	Hawkeye State. (There was an Indian chief named Hawkeye).

NAME	ORIGIN AND MEANING	POPULAR NAME
Kansas	Indian; from *ka'iza*, meaning Swift and Wind. It also is said to mean Smoky Water	Sunflower State.
Kentucky	Indian word meaning The Barrens and Prairie	Bluegrass State.
Louisiana	Latin form meaning Land of (King) Louis	Creole, Pelican or Canebrake State.
Maine	French name of a province; or English "main," to distinguish the mainland from the islands	Pinetree State.
Maryland	English name for the queen of Charles I of England	Old-Line State.
Massachusetts	Indian name meaning Place of Great Hills	Bay State.
Michigan	Indian name meaning the Great Lake	Peninsular or Wolverine State.
Minnesota	Indian name meaning Sky-colored Water	Bread and Butter, or Gopher, or North Star State.
Mississippi	Indian name meaning Father of Waters or Great River	Bayou State.
Missouri	Indian name meaning The Big Muddy	Bullion State.
Montana	Spanish for mountain	Mountain or Treasure State.
Nebraska	Indian name meaning Shallow Water or Water Valley	Tree-Planter State.
Nevada	Spanish for snow-covered	Sage-Brush or Sage-Hen State
New Hampshire	English name for a county in England	Granite State.
New Jersey	English name of an island in the English Channel	Garden State.
New York	English name of a city in England and of a duchy	Empire State.
North Carolina	Latin form meaning Country of (King) Charles	Old North, or Tarheel, or Turpentine State.
North Dakota	Indian name of tribes meaning Allies	Flickertail State.
Ohio	Indian name meaning The Beautiful River	Buckeye State.
Oklahoma	Indian name meaning Land of the Fair God	
Oregon		Beaver or Sunset State.
Pennsylvania	Latin form meaning Penn's Woodland	Keystone State.
Rhode Island	Dutch name meaning Red Island	Little Rhody.
South Carolina	See North Carolina	Palmetto State.
South Dakota	See North Dakota	Coyote or Sunshine State.
Tennessee	Indian name meaning The River of the Big Bend	Big Bend or Volunteer State.
Texas	Indian name of tribes meaning Confederates	Lone Star State.
Utah	Indian name of a tribe	Salt Lake State.
Vermont	French name meaning Green Mountains	Green Mountain State.
Virginia	Latin form meaning Virgin's Land, for Queen Elizabeth	Old Dominion State.
Washington	English and American name of a family	Corner or Evergreen State.
West Virginia	See Virginia	Panhandle State.
Wisconsin	Indian name meaning The Wild, Rushing River	Badger State.
Wyoming	Indian name meaning Great Plains	Equality State.

Alaska is an Inuit word meaning The Great Land; Arizona an Indian name that signifies The Place of Small Springs; Hawaii a Polynesian title; Mexico, as in New Mexico, is from the Aztec name of *Mexitl*, the Mexican war-god; Panama is an Indian or Spanish name; Philippines is a Latinized Spanish form meaning Land of (King) Philip (of Spain), Filipino meaning an inhabitant of the Philippines; and Porto Dico is a Spanish term meaning Rich Port.

United States Steel Cor'pora'tion. This corporation is the world's greatest combination of capital. It was organized under the laws of New Jersey in March, 1901, being formed from ten large corporations, each of which was itself a consolidation of several smaller companies. Its total capitalization is $1,404,000,000, or nearly half of all the money in the United States; it represents one sixty-seventh of the total wealth of the United States in 1900. The corporation, when founded, exercised direct and positive control over 213 manufacturing and transporting plants and companies and over 41 mines in 18 states. One hundred of the manufacturing plants were in Pennsylvania, 51 in Ohio, 15 in Illinois, 12 in Indiana, 12 in New York and the rest scattered from Connecticut to California. Its mines furnished more than half of the total production of iron-ore in the United States, four fifths of the bessemer steel and two thirds of the steel rails. It controlled 1,000 miles of railroads and a lake-fleet of 112 vessels, one third of the tonnage on the northern lakes. By "community of ownership" it controlled the anthracite fields of Pennsylvania, thousands of miles of railroads and an ocean steamship line. It has rapidly increased its holdings. The company controls steel interests in America. Our steel exports in 1900 were valued at $130,000,000. Manufacturers of other countries look upon this concentration of interests as a strengthening of American exporting capacity.

U'niver'sity, a higher educational institution, having the right to give degrees in several departments of learning and with a body of teachers or faculty in each of the different schools or colleges connected with it. The modern university, dating back to the 12th or 13th century, is thought to be the outgrowth of the schools connected with the convents and monasteries throughout Europe. When some popular teacher, as Abelard or Peter Lombard, drew crowds of students, these usually formed themselves into a corporation to which was given the name of *universitas*. Some of the early universities, as that of Paris, were formed by a body of teachers, while others, as Bologna, were corporations of students. The faculties of a university are the teachers in particular departments, as the faculty of law, faculty of arts etc. The two highest officers of a university have usually been the rector and chancellor. A degree is given by the university when a student has passed through a certain part of the course of study. The degree of doctor or master at first entitled the person who received it to teach in the university giving the degree. Pope Nicholas I near the end of the 13th

century granted the University of Paris the right to endow its graduates with the power to teach anywhere. The degree of bachelor, borrowed from the terms used in knighthood and indicating an imperfect or partial graduate, that is, one who had finished only the lowest stage of university work, was first introduced at the University of Paris in the 13th century. The colleges, as the different schools connected with a university are called, at first were mere boarding-halls, which were later appropriated to the faculties of different departments.

Europe has about 100 universities, the oldest being the University of Paris, which was organized in the 12th century but was not called a university until the 13th century. It had two chancellors, and gave degrees, those of doctor and master at first being the same, but afterward the degree of master was given to those who were qualified to teach the arts and that of doctor to those who could teach theology, law or medicine. The Sorbonne (*q.v.*) was the theological school of this university, which was suppressed by the convention in 1793, but was revived by Napoleon I as the University of France, which has charge of all public instruction. The "Academy" of Paris has five faculties: law, medicine, theology, science and letters. It usually has 4,000 students. The University of Bologna, with its charter given by Frederick Barbarossa in 1158, was especially celebrated for its law-schools; and that of Salerno, of the 12th century, for its instruction in medicine. Women were admitted to both, and graduates of Salerno practiced as "lady physicians" in the 12th and 13th centuries. Italy has twenty-one universities; Germany twenty-one; England ten; Ireland two; Scotland four; and there are about thirty in all the other countries of Europe. The oldest universities in Germany are Heidelberg, Leipsic, Tübingen, Jena and Halle. The German universities are governed by the professors, presided over by a rector or chancellor. There are three grades of professors, called ordinary professors, extraordinary professors and *privats-docent*. The ordinary professors are the highest class, and are elected by the government from candidates chosen by the faculty, and give lectures on the subject which they are selected to teach. The extraordinary professors have smaller salaries, and can lecture on any subject they please, as may also the *privat-docent*. The student attends any lectures he chooses, but cannot practice any profession without a certain course of university study. Göttingen University, founded in 1734 by Baron Munchausen under the auspices of George II, king of England and elector of Hannover, was one of the most famous in Europe, having over 3,000 students until that at Berlin was founded in 1810. The University of Tübingen, dating back to 1478, with seven faculties, is noted as having once been the seat of what is called the Tübingen school of theology. The Universities of Berlin and Bonn are among the most prominent in Germany, that at Berlin having about 6,570 students and 471 professors. Heidelberg University has a professorship of English literature, established in 1873, the first of the kind in Germany. The German universities are under the control of the government, and most of them are dependent upon state appropriations. The universities of Switzerland, Holland, Belgium, Russia and Austria are on the German model. That of Prague, founded in 1348, is the oldest in central Europe. Louvain, founded in 1425, was once very famous, as was also the University of Leyden, founded by William of Orange. Spain has nine universities, and Portugal one. The University of Salamanca, established in 1415, had at one time 10,000 students and 28 colleges. The oldest Scandinavian university is at Upsala in Sweden, and there is one at Christiana in Norway, with another at Copenhagen in Denmark.

Of the four English universities, Oxford and Cambridge are the oldest, dating back to the 13th century. Those of Durham and London are modern, being founded in the 19th century. The University of London has no colleges directly connected with it, but confers degrees, upon examination, to students of nearly all the institutions of learning in the country. Oxford has twenty-three colleges and Cambridge eighteen. This college system distinguishes the universities of England from those of the continent. A student must connect himself with a college before he becomes a member of the university. The teaching in these colleges is done almost entirely by tutors, and the professors of the university only deliver lectures on special subjects once or twice a week. Degrees are dependent upon examinations, and fellowships are provided, by means of which promising students can continue their advanced studies for years. The Scottish universities are at Edinburgh, Glasgow, Aberdeen and St. Andrews, that of St. Andrews being the oldest. They were patterned more after the German universities than those of England. The students were divided into four nations, named from the parts of Scotland from which they came. The University of Edinburgh has but one college, but this has all the powers of a university. The University of Dublin has only one college, Trinity College, but several faculties, including those of oriental and modern languages, mining and civil engineering. Queen's University has three colleges, at Belfast, Cork and Galway, each called Queen's College, and the governing body

of the university holds its meetings at Dublin.

In the United States, the term university is loosely applied to many institutions which strictly are only colleges, just as the term college includes many academies and high schools. In its strictest sense it is limited to institutions having several schools, as those of law, theology arts etc., in addition to the regular college course, where graduate work is carried on, that is, work done in the higher branches after graduation in a college. Harvard University, the oldest college in the country, now is one of the best equipped universities. It includes Harvard College, the Divinity School, the Law School, Lawrence Scientific School, Dental School (at Boston), the School of Agriculture, School of Veterinary Medicine and the graduate department. It has 583 instructors and about 5,343 students. There is also an institution for the instruction of women by the Harvard professors, called Radcliffe College. Agassiz Museum and the Peabody Museum hold its well-known collections. The finest building is Memorial Hall, built in honor of the alumni who fell in the Civil War. Harvard is at Cambridge, near Boston.

Yale University, known as Yale College until 1887, is at New Haven, Conn., and takes rank with Harvard as one of the best institutions in the country. It was founded in 1701, and in 1901 celebrated its bicentennial. It includes, besides the college or academical course, schools of law, theology, medicine, philosophy and arts. The school of fine arts, with its gallery of Italian pictures, and the Trumbull collection of 54 pictures, the Peabody Museum, the Sheffield Scientific School buildings, Marquand chapel, Osborn hall, Vanderbilt hall, the bicentennial buildings of 1901 and the library are among the noticeable structures. There are 377 instructors and about 3,200 students. Johns Hopkins University, founded in 1876, at Baltimore, Md., resembles the German universities in its methods. The work is largely graduate work, and the teaching is mainly by lectures. It was endowed by Johns Hopkins with a fund of $3,500,000. Higher mathematics and history are among the subjects in which special work is done. Clark University, at Worcester, Mass., founded in 1888, is an institution for graduate work only.

The state institutions are all called universities, but only in a few is the university system fully developed. The University of Michigan, at Ann Arbor, is one of the largest, ranking next to Harvard in the number of students. It has departments of law and medicine. Chicago University, though opening only in 1892, already ranks among the great universities of the country. Its courses are so arranged that students can be admitted at any time, as there is instruction during the whole year. It has 400 instructors, selected from the best institutions in America and in Europe, and 5,000 students. Many institutions of learning bearing the name of university in the United States are founded and carried on by the different religious denominations, as the Wesleyan Universities at Delaware, O., and Middletown, Conn., and De Pauw University at Green Castle, Ind., all under the direction of the Methodists; while Brown University at Providence, R. I., belongs to the Baptist denomination, as do the University of Rochester and Dennison University. Most of the universities, both of Europe and of the United States, are mentioned under the name of the place where they are situated, but a full account of the numerous institutions called universities has not been attempted. See articles under titles as above and COLLEGES.

University Exten'sion, a branch of educational work of English origin, whose object is to extend the advantages of higher education to the people at large. The university center organizes lecture courses along lines likely to be popular with the surrounding population, especially in such subjects as literature, economics, art, history and science, and sends out, upon request, a lecturer, usually one of its own professors, to give a series of lectures at intervals of one week or two weeks in some one general field. The success of these lectures depends largely upon the ability of the lecturer to adapt his matter to the interests and capacity of his audience.

The best university extension centers use various means in addition to the lectures to enhance the results of the extension work. Syllabi of the courses, with references for home reading, are often given, and in cases where the required books are not at hand selections of books known as travelling libraries are temporarily loaned by the university. Discussions and questions at the close of the lecture or special classes for discussion give a vital touch to the subject of the lectures, and enable the lecturer to drive home the main principles and explain obscure points. In some instances local examinations are held at the close of the series of lectures, and university credit given for work that has been satisfactorily done. A small fee is usually charged for attendance at the lectures.

Thus, as in the case of the Chautauqua schools, one may take the lectures only; or get the additional benefit of partial university work through private study supplemented by class discussion; or do full university work, so far as it goes, and secure credit for it. Extension courses have been the greatest boon to smaller towns and villages, but they have also been taken advantage of by residents of large cities.

The residents of any district within reasonable reach of a university-extension center may ordinarily have these university privileges extended to them, provided a local committee or club applies for such to the university center, and secures a hall in which the lectures may be given. The most extensive work has been done by New York, Chicago and Philadelphia centers.

University of Chicago, The, at Chicago, Ill., is the successor to a Baptist University of Chicago (1857-86) whose graduates are considered alumni of the present institution. The old college showed the interest of Chicago, from its youth, in higher education, and it did good work. When it died, Mr. John D. Rockefeller (*q. v.*) suggested to the American Baptist Educational Society that it be revived. Mr. Rockefeller himself contributed the greater part of the endowment, having in all given the new institution $23,924,322. Marshall Field (*q. v.*), S. A. Kent, Martin A. Ryerson, Miss Helen Culver, Mrs. Emmons Blaine and many other Chicagoans have donated over $3,000,000 more. Mr. Charles Yerkes contributed $300,000 for the erection of the university's observatory at Lake Geneva, Wis., and for placing the largest telescope in the world in it. The result was the organization of Chicago university. It was chartered in 1890, Dr. William R. Harper (*q. v.*) was called from Yale Divinity School to become its president, and teaching began on Oct. 1, 1892. The president and two thirds of the trustees must be Baptists, but the university is nondenominational as well as coëducational.

The university, in its organization, enjoyed every advantage that American ability and aspiration, the fullest educational experience and knowledge and the command of enormous financial resources could give. It was therefore planned on the broadest lines and with a special view to growth and change in the future, so that it shall, as far as men can foresee, adapt itself in every way to the demands of modern life as they arise. It therefore emphasized graduate study and research work; established study in summer as well as in autumn, winter and spring, thus adding 25% to the working year; gave an important place to university extension (*q. v.*); founded a system of affiliated colleges and schools whose students have special privileges in the university; and employed so large a corps of teachers that classes can be kept small, however many the students, and each individual receive personal attention. The university is organized into the five departments of schools, colleges and academies; university extension; libraries, laboratories and museums; the press; and affiliated schools. The first department includes schools of divinity, education, law, medicine and science, to which are to be added schools of fine arts, music and technology; colleges of arts, of commerce and administration, of literature, of science and University College; and numerous affiliated academies or preparatory schools. The divinity school includes five theological seminaries. The medical school has Rush Medical College affiliated with it. The commercial college teaches banking, journalism, trade and industry and transportation. University College is designed chiefly for teachers, and is conducted in the center of Chicago (*q. v.*) by the university. The university's extension offers courses by correspondence and lectures in the same subjects as the university itself, and the student who completes courses in the extension receives credit as a student in the university, which by means of this department comes into touch with the people and with public education.

The courses continue 12 weeks or six, each requiring four or five hours a week in the class. Teachers and others outside the university attend largely in summer, and every year more and more students themselves attend them. A few students reside in the houses of their societies, about a third in dormitories on the campus, but the greater part elsewhere in the city or in suburbs.

The grounds and buildings occupy a tract at 69th street (Midway Plaisance), between Jackson and Washington Parks, about seven miles from the heart of the city. The buildings, which are beautiful and very numerous, are in the English Gothic style of architecture, and grouped impressively on a plan of quadrangles. There are over 400 instructors and over 5,000 students. The requirements for admission are as severe as those of any American college or university, and the standard of scholarship is high. Consequently the university stands in the front rank of American schools of higher learning. The libraries number 461,385 volumes, exclusive of 170,000 pamphlets. In 1907 the productive funds were $12,974,211; the receipts from benefactions $5,926,989; and the income $1,222,353.

University of Colorado, a state institution, is at Boulder, and was first opened in 1877. Its organization comprises a college of liberal arts, school of applied science, school of medicine, school of law, college of dental surgery and school of music. It also provides graduate courses. It is open to students of both sexes. The faculty numbers 115, the students 850, including the preparatory school. The library has 40,000 volumes. See COLORADO.

University of Illinois, at Urbana, Ill., was founded by the state upon the donation by the national government of scrip for 480,000 acres of land. On account of this

grant the state pays the university interest at the rate of five per cent. on about $495,000. The university was incorporated in 1867 as Illinois Industrial University, and was opened to students in 1868. In 1885 the legislature changed the name to University of Illinois. It includes the college of literature and arts, college of engineering, college of science, college of agriculture, graduate school, school of library science, school of music, college of law, college of medicine and school of pharmacy. The value of its property and assets is estimated at $1,600,000. It has 430 instructors, 4,384 students and 101,481 volumes in its library. See ILLINOIS.

University of Kansas, at Lawrence, was established by an act of legislature in 1864, and is an integral part of the public-school system. The university embraces a graduate school, school of arts, schools of engineering, law, fine arts, medicine and pharmacy. The faculty numbers 118, the students 2,000 and the library 55,000 volumes. See KANSAS.

University of Michigan, The, was chartered in 1837 and began work in 1841 at Ann Arbor. It is a part of Michigan's system of public education and is controlled by regents elected by the people for eight-year terms. The university includes the departments of art, literature and science; engineering; law; medicine and surgery; pharmacy; the homeopathic medical college; and dental surgery. The courses in each department cover each branch of collegiate, professional or university study. The departments of art, literature and science, medicine and law also hold sessions in summer. The standard of scholarship is exceptionally high, and Michigan has long stood in the front of universities. It was a pioneer in coëducation, admitting women in 1870. It has many valuable collections and libraries, two observatories, two hospitals and two gymnasiums. The faculties number 338 instructors, the students about 5,000, the libraries 223,000 volumes. In 1907 the income, including the appropriation from the state, was $1,078,417. Students are charged only small fees, those from Michigan paying less than students from other states.

University of Minnesota, at Minneapolis, is a state institution and was first organized in 1851, but dates its actual beginning from its reorganization in 1868. The university comprises the graduate department, college of science, literature and the arts, college of engineering and the mechanic arts, school of mines, college of agriculture, college of law and department of medicine. It also has charge of the experiment-station and the geological and natural history survey. Students of both sexes are admitted, and the total enrollment, exclusive of summer schools, is 4,400. The faculty and instructors number 350. The library has 115,000 volumes. See MINNESOTA.

University of Notre Dame, two miles from South Bend, Ind., was founded by the Very Rev. Edward Sorin in 1842. It provides courses in the departments of arts and letters, science, architecture, civil, mechanical and electric engineering, law and pharmacy. The faculty number 82, the students 850 and the library 55,000 volumes.

University of Oregon, is at Eugene, 125 miles south of Portland. It is a part of the public-school system. The organization comprises colleges of literature, arts, science and engineering and schools of mines and mining, medicine, law and music. It has 95 instructors, 734 students and a library of 20,000 volumes. See OREGON.

University of Vermont and State Agricultural college is located at Burlington. It has a faculty of 74, 532 students and a library of 74,798 volumes. See VERMONT.

University of Wisconsin. See WISCONSIN, UNIVERSITY OF.

U'pas, a tree belonging to the mulberry family, found in Java. It grows over 100 feet high, with a straight trunk and oval leaves covered with down, and a purple fruit, something like a small, rather long plum. It was long called the deadly upas and believed to be very poisonous, so that all animals going near it were killed, and even other trees and plants — travelers finding it growing solitary in a barren waste with the bones of its victims around it. But, instead, it is found growing in the forests, and animals do not seem to avoid it. Many specimens have been collected without injury, and the tree now is in the principal botanical gardens of Europe. Its poison is similar in its effects to the poison-ivy, and is found in the juice of the tree, and used by the natives on the points of their arrows. They also make a cloth from the inner bark of the tree, which, if it gets wet, produces a disagreeable itching. Bags are made from the tough bark of one species of upas. See POISONOUS PLANTS.

Up'per Can'ada Col'lege, Toronto, was founded in 1829 by Sir John Colborne (Lord Seaton). It is modelled after the public schools of England. One hundred and fifty resident pupils are comfortably accommodated. It is beautifully located in spacious grounds in Deer Park on a hill at the northern limits of the city. There also is classroom accommodation for 150 day-pupils. The college prepares for university, honor matriculation for entrance to military schools and medical colleges. Special arrangements may be made for commercial instruction. It has an infirmary, swimming baths, skating rinks, cricket grounds etc. Its cadets' rifle-corps is one of its interesting features. It is well-provided for in the matter of scholarships and prizes The pre-

paratory school has proved attractive. Its graduates are met the world over, many having won a distinguished name.

Upsala or **Uppsala** (*ŭp-sä'lä*), a city in Sweden, on Sala River, 40 miles northeast of Stockholm. It is in a fertile plain with fine buildings and parks. The cathedral, begun in the 13th century, is the most celebrated in Sweden. The university, founded in 1474 and richly endowed by Gustavus Adolphus, has fine buildings, over 70 instructors and 1,835 students. There are also connected with it a botanic garden, a mineralogical collection, a museum and an observatory. Population 24,450.

Ur of the Chaldees, mentioned in *Genesis xi: 27-32* as the point from which the family of Abraham migrated to the west, has been identified with a city of southern Babylon, near the Euphrates. This city was the seat of a dynasty of kings before it fell under the sway of Babylon. Yet there are indications that the home of the family of Abraham was higher up the Euphrates than the city of Ur (the modern Mugheir), so that the identification is not certain. The ruins of Ur at Mugheir still stand; their most conspicuous feature being a temple to *Sin*, the god of the moon.

U'ral Mountains, a part of the boundary between Europe and Asia, separate European Russia from Siberia. The chain is made of a series of parallel ridges in the southern part, running toward the northwest, the highest summit being 4,680 feet. Farther north there are several low ridges, with peaks reaching 5,115 feet, while one low ridge in the extreme north completes the range. The middle part of the range is very rich in minerals, having mines of gold, copper, platinum and iron. Precious stones, as the emerald, beryl, topaz, amethyst and diamond, are also found. The population inhabiting the mountains and supported by the mines is 200,000.

Ural, a river of Russia, separating Europe from Asia. It rises in the Urals, flowing south and southeast for 1,100 miles and emptying into the Caspian. There is very little navigation. Its banks have been fortified by a line of forts, and its fisheries are very valuable.

Ura'nium, a metal first isolated in 1842 from the oxide of uranium, discovered previously by Klapworth. It is found in uranite or pitchblend in Bohemia, Saxony and Cornwall, England, and is prepared by heating a mixture of uranium chloride and sodium chloride with carbon or, preferably, with metallic sodium. It, with its other mineral compounds, possesses a notable rapid activity, emitting rays which have a photographic action and make phosphorescent substances luminous.

U'ranus, in Grecian mythology, is sometimes the son, but generally the husband, of Gæa the earth, by whom he became the father of Oceanus, Saturn, the Cyclops and others. He hated all his children, and confined them in Tartarus; but Cronus, at the instance of his mother, overthrew and dethroned him.

Uranus. See PLANETS.

Ur'ban, the name of eight popes, of whom the following deserve special mention:

Urban II, a Frenchman by birth and originally a monk of Cluny, was elected in a council held at Terracina in the year 1088. His name was Otho, and soon after his election he resumed possession of Rome, the fortresses of which had been held by the antipope Guibert, styled Clement III, whom he compelled to withdraw. A great council was held in Piacenza in 1095, in which the antipope and his adherents were excommunicated; and at the same council the crusade was proclaimed. Urban died in 1099, just when the crusade which he had organized was ending in the occupation of Jerusalem.

Urban V (originally William de Grimoard) was the last of the popes who resided at Avignon. By him the papal seat was retransferred to Rome. He was elected pope on the death of Innocent VI in 1362 and died in 1370, leaving the reputation of great piety and of zeal for religion and good morals.

Urban VI, whose name was Bartolommeo Prignani, was the pope under whom the great western schism had its origin. On the death of Gregory XI in 1378, Prignani was elected in a conclave held at Rome in circumstances of great excitement, owing to the apprehensions of the populace that a French pope would be elected and Rome again abandoned. Prignani was crowned under the title of Urban VI, but immediately afterwards 12 French cardinals assembled at Anagni and revoked his election, declaring that they had voted for him under fear of violence. They were joined by three Italian cardinals, and then proceeded to elect the cardinal-bishop of Cambray pope under the title of Clement VII. Clement took up his residence at Avignon, but Urban remained at Rome, where he appointed a number of new cardinals and excommunicated Clement and his adherents. The result was that Urban was recognized as lawful pope by one portion of the church and Clement by the other, each maintaining his claim by extreme measures. Urban was besieged by Charles, king of Naples, at Novara, whence he withdrew to Genoa, taking with him as prisoners those cardinals of his party with whom he had quarreled, several of whom he is said to have put to death. He died in 1389 from injuries sustained in a fall from his horse.

Urban VIII, the successor of Gregory XV, whose family name was Maffeo Barberini, was born at Florence in 1568. After

many years of service in various capacities, he was elected pope in September of 1623. His memory has suffered through the imputation of nepotism; but his pontificate on the whole was vigorous and enlightened. He was the founder of the celebrated College of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library. His pontificate was also distinguished by the acquisition of the duchy of Urbino to the Holy See in 1626. He died in 1644, and was succeeded by Innocent X.

Urban'a, Ill., county-seat of Champaign County, is noted as the seat of the University (*q. v.*) of Illinois. There also are a good system of public schools, a high school and two libraries. Urbana's most important industrial establishments are the "Big Four" car-shops, employing 700 men, next the brick-works and then the lawn-mower and machine works. Population 10,000.

Urbino (*ŏŏr-bē'nō*), in central Italy, is situated between the Metauro and Foglia Rivers, 20 miles southwest of Pesaro. It has a magnificent palace, once the residence of the dukes of Urbino, where was the famous library of the Della Rovere family, afterwards removed to the Vatican. Another handsome palace is that of the Albini, a family who gave the church Pope Clement XI. Urbino is the birthplace of Raphael, and became a part of the kingdom of Italy in 1860. It is the seat of a free university founded in 1564. Population of Pesaro and Urbino 25,103.

U'rim and Thum'mim, a mysterious contrivance on the breastplate of the Jewish high-priest, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved or of two images personifying — most probably — Truth and Revelation. Others assert that the words personified by these images were Light and Perfection, and still others that they were Doctrine and Judgment. The consulting of the Urim and Thummim as an oracle was a very solemn ceremony with the Jews, but it is never mentioned after Solomon's time.

Ur'sa Ma'jor. See BEAR, GREATER AND LESSER.

Ursa Mi'nor. See BEAR, GREATER AND LESSER.

Ur'sula, St., a female saint and martyr, especially honored in Germany and Cologne, the place of her reputed martyrdom, who is variously assigned to the third, the fourth and the fifth century. According to the legend, she was the daughter of Deonatus, a British king, and on account of her beauty was sought in marriage by the son of a pagan prince. Fearing that she might bring ruin upon her father by a refusal, she consented to marry the prince, but made it a condition that she should be allowed three years, during which she proposed to make a pious pilgrimage in company with her ten maidens, each being accompanied by a thousand other maidens, making 11,000 in all. The maidens were collected from all parts of the world, and the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne and thence to Basel. Leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they returned down the river to Cologne, which had meanwhile fallen into the hands of an army of Huns under the leadership of a chief, who, although not named, plainly is the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarians, by whom all were seized and put to death. A host of angel warriors, however, interposed and smote the cruel Huns; and in gratitude to their martyred intercessors the citizens erected a church on the site now occupied by the Church of St. Ursula.

Ur'sulines, a religious order of women in the Roman Catholic church, taking their name from Saint Ursula. They derive their origin from Angela Merici, who, early in the 16th century, formed at Brescia an association of young women who fully devoted themselves to the care of the sick, the instruction of children and the relief of the poor. In 1565 a house was opened at Cremona, and the order spread over several dioceses in Italy. Soon afterwards it was established in France, where one of its members was the celebrated Madeline St. Beuve. It was in France that the sisters added to their vows the instruction of female children, which has since formed the most marked characteristic of their order.

Uruguay (*o͞o'rŭ-gwī'*), the smallest of the South American republics, is 53 times the size of Rhode Island, the smallest state of the Union, and nearly equal to the combined area of Ohio and Indiana. It lies between Brazil on the north and northeast and the Argentine Republic on the west, with the Atlantic Ocean on the south and southeast. Its greatest length and breadth are a little over 300 miles each, the total area being 72,210 square miles. Brazil, the largest of the South American countries, is 43 times the size of Uruguay. Uruguay is considerably further east than the eastern limit of the United States, being directly south of Newfoundland. Its population is 1,103,040.

Surface and Climate. Uruguay is a country of hills and plains, with no elevations exceeding 2,000 feet. In the south the country is a sort of terraced upland, with a treeless coast possessing some good harbors. Rio de la Plata, a broad deep estuary,

and Uruguay River, with their tributaries, furnish easy and ample water-communication with the interior. There are 1,273 miles of railways, 4,916 of telegraph, 11,414 of telephone and 5,340 of roads. The climate is mild and on the coast is equable, but in the interior is subject to sudden changes. The rainfall is abundant, averaging 40 inches annually; it is heaviest on the coast.

Resources. The wealth of the country consists mainly in its pasturage, which supports large herds of cattle, horses and sheep, the wool of Uruguayan sheep being of superior quality. The latest record reports 7,029,078 cattle; 17,927,071 sheep; 659,726 horses; and 20,689 mules. The value of exports in 1906 was $33,402,024. Agriculture is growing in importance, wheat and corn being the chief crops; flaxseed, barley and oats are also raised. Of manufacturing establishments the most important are packing-houses, flour-mills, furniture, cigar and carriage and wagon factories.

Government. The president is elected by a general assembly; his term is four years and he is not eligible for a succeeding term. The general assembly consists of two houses, a senate and a chamber of representatives. A vice-president presides over the senate. The republic is divided into 19 departments, the chief executive of each being appointed by the president.

Cities. The chief cities are Montevideo, the capital and chief port, population 309,390; Paysandu (12,000), a port on Uruguay River; Salto (14,000); Mercedes (10,000); and San José (9,000).

Education and Religion. Primary education is obligatory. In 1906 there were 619 public and 289 private schools. The first had 1,218 teachers and 57,638 pupils; the second, 289 and 17,242 respectively. In 1907 it was arranged that 150 public schools be added. At Montevideo are an university, a preparatory school and an institute of experimental hygiene. In 1905 the university had 112 professors, 530 regular students and 661 secondary pupils. There also are a military college, many religious seminaries, normal schools and a state school of arts and trades. But half of the population over six years old is illiterate. Roman Catholicism is the state religion, but there is complete toleration.

History. Uruguay was discovered by Solis of Spain in 1515, and colonized by Sebastian Cabot in 1527. The Indians, however, successfully resisted Spanish attempts at settlement until 1624, when the oldest city was founded. Spain and Portugal quarreled over the possession of Uruguay, and the Brazilians and Argentines continued the quarrel until 1828. In 1811 the Spanish in Uruguay, whose ancestors had from 1726 colonized Montevideo from Buenos Aires, threw off the yoke of Spain, and the settlements formed a confederation. The Brazilians in 1822 made it a province of Brazil, but in 1828 united with Argentina to make Uruguay an independent republic. For 80 years, however, it has suffered almost incessantly from internal discords. Consult the Bureau of American Republics' bulletins and *Handbook of Uruguay* and Cattell's *Foreign Commercial Guide.* See AMERICA (SOUTH), ARGENTINE REPUBLIC, BRAZIL and PARAGUAY.

Uruguay, a river of South America, rises in southern Brazil. It flows westward a little less than 100 miles, and then southward, forming a boundary line between the Argentine Republic on the west and Brazil and Uruguay on the east. It unites with the Paraná to form the Plata in 34° S. latitude, its total length being about 1,000 miles. Its chief branch is the Rio Negro.

Urumiah (*o͞o'rŏŏ-mē'ä*), a town of Persia (*q. v.*), ten miles west of Lake Urumiah, in a wide and fertile plain, is surrounded with a mud-wall but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the richer classes are lofty and spacious, and many of those of the poor are adorned with flowers and vines. The city is the seat of a Nestorian bishop and of an American Presbyterian mission, which is in a very prosperous condition. The city is said to have been the birthplace of Zoroaster (*q. v.*), founder of the religion of ancient Persia, and has a population of 30,000.

Urumiah, the principal lake of Persia, is about 4,000 feet above the level of the sea, and nowhere exceeds 20 or 25 feet in depth. It is about 80 miles in length, with an average width of about 25 miles. Its waters are largely impregnated with salt, and are so heavy as to be little ruffled by the strongest wind. No fish are found in it, although several rivers empty into the lake. Its average depth is only about 12 feet, and it is fast drying up, leaving a gradually widening beach of salty crust, which supplies the whole of Kurdistan with salt.

U'sury. This word originally meant anything charged by the lender of money for the use of it; but it now refers to any charge above the legal rate. In most, if not all, civilized nations there are laws limiting the rate which lenders of money may charge for its use, with greater or lesser penalties for all charges which go above this limit. In the United States the laws of the states vary somewhat in this respect, although in all of them a legal rate is established for cases where there is no express contract — six per cent. in nearly all the states — and another limit prescribed — generally eight or ten per cent. — within which contracts may be made by

the parties, and beyond which contracts are rendered void or at least cannot be enforced by law.

U'tah (named from the Ute Indians), a western state of the Union, a trifle larger than Idaho; area 84,970 square miles; breadth 275 miles; extreme length 345. It is bounded on the north by Idaho and Wyoming, on the south by Arizona, on the west by Nevada and on the east by Wyoming and Colorado. The state, which ranks eighth in size, was first settled by the Mormons in 1847, and by them called Deseret. It occupies an elevated plateau, at an average altitude of 5,000 feet, from which mountain-peaks rise 11,000 to over 13,600 feet, with correspondingly deep valleys. The Wasatch range forms its chief topographical feature in the northern and middle regions, with the notable water-basin of Great Salt Lake northeast of the Great American Desert and north of Utah Lake. The population of the state in 1900 was 276,749; in 1907 it was estimated at 332,000. Its capital is Salt Lake City (61,202). The other chief towns are Ogden (17,165); Provo City (6,185); and Logan (5,451).

Surface and Drainage. Besides the high, central Wasatch range, with its eastward spurs known as the Uintah Mountains, there are many other elevations southeast and west. The chief ones are Needle, Wah-Wah, Beaver River, Parowan, Henry, Deep Creek, Abajo, La Salle, Thomas, Desert, Terrace and Goose Mountains. From these ranges soar lofty peaks, as Mts. Peale and Gilbert and Emmons, Wilson, Hodges, Tokewanna and Lovenia Peaks, each of which exceeds 13,000 feet in height. The lake and river drainage also is considerable and varied, embracing (besides Great Salt Lake, 2,500 square miles in extent) Lake Utah and Bear and Sevier Lakes and Green, Grand, Colorado, Snake, Bear, Sevier, Virginia, Jordan and San Juan Rivers. In San Juan County, in the uninhabited and almost inaccessible southeast, are the greatest natural bridges in the world. Emery Knowles discovered them in 1895. They number three. Augusta Bridge is 265 feet in height, 35 in width, 83 in thickness and 320 in span; Caroline 182, 60, 60 and 350 feet respectively; and Edwin 111, 30, 10 and 205. This is the slenderest and most graceful bridge. Each consists of light sandstone. The mountains around rise 11,000 to 13,000 feet.

Resources, Mining and Agriculture. The natural resources consist of the yield from minerals and from agricultural operations almost entirely. In 1907 the production of wheat amounted to 4,637,000 bushels; of oats to 2,025,000 bushels; of corn to 356,032 bushels in 1906; of beet-sugar (in 1906) to 21,337 tons. The area devoted to crops in 1905 was 700,396 acres, embracing hay and forage, besides the cereals named. The minerals include coal, of which in 1906 1,839,219 tons were mined; copper, the yield of which in 1906 was 24,856 tons; silver 11,550,634 ounces ($7,738,925); gold $5,131,000 (the yield being 252,439 ounces); and lead, 56,260 short tons. Other mined products embrace clay, salt, zinc, bismuth, iron, cement and building-stone. The wool-product in 1906 was 4,322,000 pounds. In 1907 Utah had over 2,853,000 sheep, 75,919 dairy-cows, 306,000 neat cattle and 117,387 horses and mules.

Manufactures. There has been considerable progress in the development of manufactures in recent years. In 1905 the number of industrial establishments exceeded 600, employing some $26,000,000 of capital and turning out products to the aggregate value of $38,926,464. The two principal industrial centers are Salt Lake City and Ogden, the leading industries throughout the state being the smelting and refining of copper and lead ore, flour and grist-mill products, engineering work, railway repairing, printing and publishing, confectionery manufacture, cheese and butter making, the preserving and canning of fruits, vegetables and condensed milk, together with foundry and machine output, the brewing of malt-liquors and cattle-slaughtering and meat-packing.

Commerce, Finance and Transportation. The railway mileage in 1907 was 2,276 miles, the more important lines being the Rio Grande Western, the Oregon Short Line, the Central Pacific, the Los Angeles and the Union Pacific. There were eight short lines also. In 1906 the state had 17 national and 41 state and private banks. The taxable property assessment for 1906 was close to $146,133,649, while the debt amounted to $900,000.

Education. The school-system is under a board, aided by a state and a county superintendent. Education is free, as are the text-books. Education from 8 to 16 is compulsory. Illiteracy is only 5% of the population, and half of the 6,141 illiterates are foreign-born. From a school population of about 95,000 in 1906 the enrollment was 76,000; while the average daily attendance was 57,000. Normal schools for the training of teachers are maintained at Salt Lake City in connection with the state University of Utah and also at Cedar City. Higher education is represented by the University of Utah, which has 100 instructors and 976 students; by Brigham Young College at Logan (Latter Day Saints) with 45 instructors and 850 students; and by Westminister College (Pres.) at Salt Lake City; there also is an agricultural college at Logan. The state university is co-educational, and, besides its normal-school department, has a school of mines and a school of arts and sciences.

History. Though the first settlement of note was made in 1847 at Salt Lake City by Mormons under Brigham Young, who were driven out of Nauvoo, Ill., the region (organized as a territory in 1850 and admitted to statehood in 1896) has an early history. This includes the visit of Spanish explorers in or about 1540 and the exploration of Colorado River. Seeking a route from Santa Fé to Los Angeles and the Pacific, two Franciscan friars in 1776 visited Utah and Sevier Lakes, where trading and hunting parties were afterwards organized. In 1824 Great Salt Lake was discovered by Capt. Jas. Bridger, a trapper, who was seeking to trace the course of Bear River. Posts were established later, which were welcome to immigrants passing through the territory to Oregon and California, as also to the bands of traders and hunters who now began to operate in the region. Among these posts was Fort Ashley, built in 1825 and for a time occupied by an expedition under William Ashley. Later expeditions were those under Capt. Bonneville and John C. Frémont, the report of the latter, it is related, being instrumental in inducing the Mormons to come, though the Mexican War was in progress. Following the band of 150 Mormons that arrived in 1847 with Brigham Young, there came others to the colony at Salt Lake City, the region meanwhile having passed (1848) from Mexico to the United States. Under the Mormon Church the state of Deseret, as it was called, was organized in 1849, while appeals were made to Congress for admission into the Union. This was refused, though the federal executive in 1850–1 created the territory of Utah and appointed Brigham Young as governor. For six years Young held office, the Mormon colony being considerably added to by proselytes and new arrivals while he was governor, though the region began to be populated by non-Mormons. Between the two sets of colonists there arose opposition, while trouble also came from the territorial officers sent by the federal government, who were opposed and interfered with the rule of the Mormon Church, tenacious of its power and hold upon the region. In 1857 such were the difficulties that arose from the rival control of affairs, which more than once manifested itself in violence and attempts at mob-rule, that the federal authorities determined to supersede Young in the governorship, and for that purpose and to subdue disaffection sent troops to Salt Lake City, deposed Young and appointed a new governor. The outbreak of the Civil War for a time diverted federal vigilance over matters in the territory, but soon antipolygamy legislation arose and ere long dealt drastically with Mormonism. Immigration of an anti-Mormon character helped to neutralize the rule of the church, while the Edmunds bill of 1882, following other expedients of a legislative character, disfranchised all polygamists and abolished many of the officers in the territory and with them the corporation of the Mormon Church, while the property of Mormons was escheated. So threatening and adverse to the church and its organizations was the aspect of affairs, that in 1890 President Woodruff, the head of the church, was necessitated to issue an ordinance discountenancing polygamy,—a timely action which met the approval of a general conference of the Mormon Church. Polygamy, nevertheless, continued for a time further to be practiced, and the taint of it so affected at least one senator from the state that he was not allowed to take his seat. In the case of another senator the national senate took action to inquire into the prevalence or existence of polygamy since 1890; but whatever there was, as time passed, was neutralized, kept in abeyance and finally stamped out by local prejudice against it among the anti-Mormon element in the state, while the rise and influence of political parties on national lines were effective in expunging the obnoxious practice and clearing the state of the immoral taint. The constitution given the state in 1895, just a year before the admission of Utah to statehood, forbade polygamy. In 1905 settlement was extended by the opening of the Uinta Indians' reservation. The organization of the Mormon Church or Latter Day Saints, as they are called, continues to exist, though division has entered into their ranks and made two folds of them — one the Utah branch with 700 ministers, 796 churches and about 300,000 members, and the other, a Reorganized Branch, with headquarters at Lamoni, Iowa, which numbers about 50,000 with 860 active ministers. Consult Jones' *Utah* and Bancroft's *The Pacific States*. See MORMONS.

Utahs or **Utes,** a tribe of Indians formerly roaming over Utah, Colorado and New Mexico, but now occupying reservations in Utah and Colorado. Their number is about 5,000.

U'tica, an ancient city of Africa, near the Bay of Carthage and a short distance from the site of the modern city of Tunis. The Tyrians are said to have founded it 287 years before Carthage was built. It was an ally of Carthage in her early wars with Rome. But in the third Punic War Utica early made separate submission to Rome, and, when Carthage fell, was rewarded with a part of her territory. The Roman governor made his residence there. In the accounts of the struggles between Sulla and Marius and between Cæsar and Pompey it is often referred to as an important city. It had an amphitheater, which would seat 20,000 people, and an artificial lake on

which mimic sea-battles were fought. Its water-supplies were stored in many immense cisterns, some of which are 136 feet long, 19 wide and 20 or 30 deep. Augustus made it a free city. The Vandals conquered it in 439, then the Byzantine emperors recovered and held it till the 8th century, when the Arabs conquered and destroyed it.

Utica, N. Y., county-seat of Oneida County, on Mohawk River, 95 miles from Albany and 52 miles from Syracuse. The city is regularly and handsomely built, and rises from the south bank of the river to an elevation of 150 feet. One of the state hospitals for the insane is here, with a number of other benevolent and charitable institutions. The manufactures amount to several millions annually, and comprise a great variety of products. The annual cost of maintaining the public schools is $220,000; the number of teachers employed is 300; and there are 12,000 pupils enrolled. At the Revolutionary War Utica was a frontier trading-post, and also was the site of Fort Schuyler, built to guard a settlement against the French and Indians. Population 67,947.

Uto'pia is the name given by Sir Thomas More to the imaginary island which he makes the scene of his work, entitled *Utopia* (from Greek words meaning nowhere), first published in Latin in 1516 and translated into English by Bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, free from all the cares, anxieties and miseries of mankind. In this community all property belonged to the government, no private ownership being allowed; and the wants of all persons were supplied from the common stock. More's work, which is still published, attained a great popularity, and the epithet Utopian is still applied to all plans for the improvement of society that are deemed visionary and impracticable. A counterpart to More's work is found in a production of the present day, entitled *Looking Backward*, by the late Edward Bellamy. See COMMUNISM, MORE and SOCIALISM.

Utrecht (*ū'trĕkt*), a city of the Netherlands, capital of the province of Utrecht, is beautifully situated in a district of rich, grassy meadows, extensive orchards, flower-gardens and cultivated fields. It is favorably situated for trade, being the point from which several railroads radiate and having excellent water-communication by way of the old Rhine and the Vecht. Utrecht is one of the oldest cities of the Netherlands, and probably was founded by the Romans. It was here that the union of the northern provinces for the defense of their political and religious freedom against the tyranny of Spain was formed on Jan. 23, 1579. It is the seat of an university. Population 114,321.

Utrecht, Treaty of. The treaty or treaties of peace concluded in 1713 between France and the allied powers — England, Austria etc. — after the ten years' war relating to the Spanish succession. Consult Macaulay's essay reviewing Lord Mahon's *History of the War of the Succession in Spain.*

V

V (*vē*), the twenty-second letter, is a vocal consonant. Being made by the lips or by the upper teeth and lower lip, it is classed as a labiodental, as in *vain, vivid, lived.* Nearly every English word beginning with *v* comes from French or Latin. No English word ends with *v*, nor is *v* ever doubled. The Romans used V as a numeral (5) as well as a letter. Until recently words beginning with *u* or *v* were grouped together. *V* is more easily engraved than *U*, especially on stone.

Vacation Schools are the result of a recent extension of the public-school system in New York City, Chicago, Newark and a very few other progressive centers of population. They originated in New York as a philanthropic experiment conducted by a private society. It was recognized by the city authorities that the success of the experiment was worthy of public recognition; and playgrounds and vacation schools were accordingly established in connection with the public-school system. The vacation schools of New York are administered by a district superintendent and a number of special directors under his supervision. In the vacation schools manual and artistic activities are exercised to a high degree. Music and dancing are provided for on roof-gardens where the open, fresh air may be enjoyed. There are even baths where swimming is taught. But the vacation school is by no means a place for recreation merely, unless the term recreation be extended so as to include many branches of useful work. In New York there were in 1902 54 vacation schools, a number now somewhat increased. In these schools are taught basketry, benchwork, Venetian iron-work, chair-caning, carpentry, fret-sawing, whittling, work in burned wood and leather, sewing, embroidery, crocheting, millinery and domestic science. Often so much taste and ability are shown in one or another of these directions that a youth or girl finds his or her natural vocation through the vacation school. There are classes in the vacation schools even in the care of the sick, of the accidentally injured and of babies. Already there are indications in city tenement life that the art and culture disseminated by the vacation schools are entering into the lives of the people. Home conditions improve; and it is much, moreover, to give healthy and happy occupation to the youth who would else be subjected to the idle and vicious influences of the streets. In 1902 the schools cost the city $275,000; but this sum was applied to the maintenance of the evening recreation centers and afternoon playgrounds as well as the vacation schools properly so called. The latter essentially are summer institutions which meet for five mornings a week during a term of six weeks. The evening recreation centers, whose work is elsewhere described, are open during all the year. (See PLAYGROUNDS.) The afternoon playgrounds are open for systematic sports during two months of the school vacation. At the back of the movement for vacation schools is the feeling that, in large cities at least, the prolonged summer vacation is not without its mental and moral dangers, springing chiefly from the lack of occupation of the young.

Vaccination (*văk'sĭ-nā'shŭn*) is the process by which the disease termed *vaccinia* or cowpox, from the Latin word *vacca*, a cow, is introduced into the human system to protect it against the attack of the more severe disease of smallpox. In his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ* Jenner, the discoverer of this remarkable remedy, establishes the following facts: (1) That this disease when communicated to man is a sure protection from smallpox; (2) that the cowpox alone, and not other eruptions affecting the cow, which might be confounded with it, has this power of protection; (3) that the cowpox may be communicated at will from the cow to man by the hand of the surgeon; and (4) that the cowpox once ingrafted on the human subject may be transferred from person to person, giving each one the same immunity from smallpox as was enjoyed by the person infected directly from the cow. See JENNER.

Vacuum (*văk'ū-ŭm*), the region in a closed vessel from which the air has been largely removed. To completely remove all gases from a closed vessel is impossible. To obtain a complete vacuum appears therefore to be a hopeless task. With an ordinary air-pump, in good working condition, one may produce a vacuum in which the pressure is not more than two or three millimeters of mercury. But by means of a mercury pump one may easily exhaust a vessel until its pressure is only one-millionth that of the atmosphere. If, however, elaborate precautions are taken with a Sprengel pump, a vacuum of only one hundred-

millionth that of the atmosphere may be obtained. See AIR-PUMP, and read Kimball's *Physical Properties of Gases*, chap. v.

Valdai (*vål-dī'*) **Hills,** a range of hills in western Russia, midway between St. Petersburg and Moscow, 300 feet in height, but rising in Mount Popovagora to 1,080 feet. They extend about 250 miles; were formerly forested; but now are mostly cleared and cultivated. They form a watershed between the Volga, Dnieper and Düna.

Valen'cia, an ancient city and seaport of Spain and formerly its capital, stands on the shores of the Mediterranean, 300 miles by rail from Madrid. The Huerta, 35 square miles in extent, which surrounds the city, resembles an immense orchard, and is watered by an intricate network of pipes and rivulets laid down by the Moors 800 years ago and answering its purpose down to the present day. There are numerous picture-galleries in the city, in the chief of which only the productions of the great Valencian school are to be seen. There are a museum, a botanical garden and a fine old cathedral. The university, with its library of 50,000 volumes, has 39 professors and 1,728 students. The custom-house, dating from 1758, is now the cigar-factory, which employs more than 3,000 persons and produces 120,000 pounds of tobacco yearly. Valencia is connected with Madrid by rail, and is a famous summer resort of the more prosperous classes. Population 213,530.

Valencia, a town of Venezuela, South America, in the province of Carácas, two miles east of Lake Valencia. The city is situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Population 38,654.

Val'entine, Basil, a celebrated German alchemist of whom so little is known that it is even disputed whether he lived in the 12th or in the 13th century. It has been maintained that he was a monk of the order of St. Benedict in St. Peter's convent at Erfurt; but his name does not appear on the Erfurt list nor on the general lists at Rome. His works were mostly written in the old Upper-Saxon dialect, and were not printed until 1602, after which many of them were published in the form of French translations.

Valentine or **Valenti'nus,** presbyter and martyr, according to the Roman legend, was arrested and thrown into chains at the instance of Emperor Claudius about 270 A. D. He was handed over to Calphurnius, who employed one Asterius to win him back to idolatry, but, instead of this, Asterius was won over to the Christian faith on account of the healing of his blind daughter by Valentine. The saint was kept in prison for a long time, but was finally beheaded. The custom of sending valentines is the survival of a practice connected with the worship of Juno on or about Feb. 14, and its association with this saint is purely accidental.

Valentin'ian I, emperor of the Western Roman empire from 364 to 375 A. D. As a military officer under Julian and Jovian he rose to a high position, and on the death of Jovian was chosen emperor by the officers of the army at Nicæa. Soon after this he named his brother Valens as his colleague, and the two brothers divided the empire between them, Valentinian, as emperor of the west, taking Italy, Illyricum, Spain, Britain, Gaul and Africa. During Valentinian's reign there were wars in Africa and Germany, and Rome also came into collision with peoples of whom we now hear for the first time — Burgundians, Saxons and Alemanni. The emperor's headquarters were at Treves during the greater portion of his reign. His general administration was wise and able and, in many respects, beneficent. Although hard and exacting in the collection of taxes from his people, the money was spent in defending and improving his dominions, and not in idle show or luxury. He died of apoplexy in 375, and was succeeded by Gratian and Valentian II, his sons.

Valentinian II, an infant four years of age, and his half-brother Gratian, a lad of 17, became joint emperors of the Western Roman empire in 375 A. D. They made Milan their residence, while the empire was at least nominally divided between them, Valentinian taking Italy and a part of Africa. Gratian died in 383, and four years later Maximus, who had commanded a Roman army in Britain, crossed the Alps into the valley of the Po and threatened Milan. The emperor and his mother Justina fled to Theodosius, emperor of the East, and besought his assistance, and in accordance with their request Theodosius marched into Italy with an army, defeated Maximus, and again set Valentinian on the throne. He was assassinated in 392 A. D.

Valentinian III, grandson of Theodosius the Great, was declared Emperor of the West in 425 A. D. His reign of 30 years was a period of great and terrible events, associated with the names of Attila, Genseric and Ætius, "the last of the Romans." Valentinian's usual residence was at Ravenna; but he fled to Rome in 452 on the approach of Attila, who, after ravaging Italy, died in the following year. In 454 Ætius, who had won the great victory over Attila at Chalons in 451, and who alone could have saved Rome from the destruction which hung over her, was treacherously murdered by Valentinian; and the next year the crime was avenged by the murder of the emperor himself while he was viewing some games in the Campus Martius. With the death of Valentinian the family of Theodosius became extinct.

Valentinus was the most important Christian theologian before Origen. He sought to combine the results of Greek philosophy with the doctrines of the Gospel, and treated the manifestation of Jesus as the keystone in the structure of thought which Greek science had reared. He may be regarded as superior to Philo in many respects and as having surpassed Origen in delicacy of perception and vigor of style, although he was far behind him in the extent of his learning. He came to Rome from Egypt about 138 A. D., and died about 160.

Valet'ta, an important fortress and beautiful city, capital of the island of Malta. The city was founded by John Parisot de la Valette, who so gallantly defended the island of Malta against the Turkish fleet in 1565. Alone and unsupported by any of the Christian powers, La Valette held the island under circumstances of great difficulty and distress; and at the end of four months the Turks were compelled to withdraw, after suffering a loss of several thousand men. The city contains many relics of the occupation by the Knights of Malta. Population 60,000. See MALTA.

Valhalla (*văl-hăl'là*), in Scandinavian mythology, the "hall of the slain" — the abode of Odin in Asgard, the palace of Immortality, inhabited by the souls of heroes slain in battle. In the old Norse or Viking era, the *Eddas* relate, Odin and his chiefs dwelt in a sort of Olympus (Asgard) — the Norse Pantheon — which had two mansions, Gladsheim for the gods and Vingolf for the goddesses. There also was Walhalla, wherein Odin placed one half of the heroes slain in battle, the other half being received by Freja, the wife of Odin, who presided over smiling nature, sending sunshine, rain and harvest. The roof of Valhalla was resplendent with gold; spears, shields and armor adorned its walls. Out of this abode rode forth Valkyrs (or choosers of the slain) on invisible horses, to the battles of men on earth, and with their spears pointed out the heroes who should fall, whom they caught as they fell and bore to Valhalla in their arms. Troops of these invisible horsemen issued daily to engage in combat and return at night to be entertained with the never-ending hospitality of Odin. See the Norse prose *Edda*. Figuratively, Valhalla (or Walhalla) has come to mean a hall or temple adorned with statues and memorials of a nation's great ones, especially its soldier heroes.

Val'jean', Jean, the hero of *Les Miserables*, one of the best known and loved of the romances of Victor Hugo, is a former galley-slave whose life becomes changed through the goodness and kindness of a bishop. The bishop entertains Valjean, who escapes with the precious candlesticks of his host! Valjean is captured and brought back; but the bishop declares he has given him the candlesticks, and makes him a convert. Hereafter, Jean Valjean becomes the guardian of a beautiful girl, Cosette, to whom he devotes his life. The story of Jean Valjean is that love begets love and works miracles. "His whole heart melted in gratitude, and he loved more and more."

Valladolid (*văl'yà-thō-lĕth'*), a famous city of Spain, at one time capital of the whole country and still capital of the province of Valladolid, stands on the left bank of the Pisuerga, 150 miles northwest of Madrid by railway. It is 2,000 feet above the level of the sea, and has a healthful climate, the air being pure and genial and the sky generally cloudless. As Valladolid was the residence of the court prior to its removal to Madrid in the 16th century, it contains many large and decayed dwellings, although many new mansions have been erected and the streets have been paved, enlarged and multiplied. There are a noted university, founded in 1346, a palace and an unfinished cathedral. Here Ferdinand and Isabella were married and here Columbus died. The city communicates with the Atlantic Ocean by the Douro and with various portions of Spain by canal and railway. Population 68,789.

Valladolid, a town of Mexico, in the state of Yucatan, 90 miles southeast of Merida, stands in the midst of a highly cultivated tract of country. It is the best-constructed and healthiest town in Yucatan, and is the seat of cotton manufactures. Population 14,000.

Vallejo (*văl-yā'hō*) **Cal.,** a city in Solano County, at the mouth of Napa Creek, which empties into the northeast part of San Pablo Bay. Vallejo is connected by steamship lines with San Francisco (30 miles to the southwest); it is also reached by the Southern Pacific Railroad, as is South Vallejo. Adjacent to both is the Mare Island Navy-Yard (U. S.), which gives employment to about 2,000 men. There is also a quicksilver mine in the vicinity, while the region is a fertile one for farming and fruit-growing. Besides its lumber yards, planing-mills and fish-packing establishments, it has flour-mills, brick-yards, a tannery, beer-bottling works, a cement-works and carbonated water factories. It has a Sailor's Club house, a Home for Orphans, a Carnegie Library and the St. Vincent's Convent and school. Founded in 1851, the city was designed at one time as the capital of the state and here for a couple of years (1851-3) were held the annual session of the state legislature. Population 7,965.

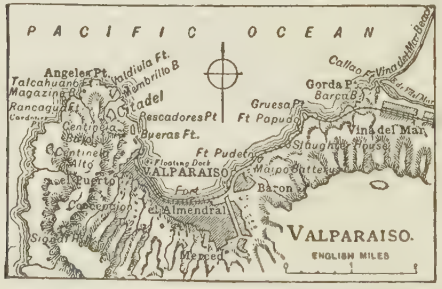
Valley Forge, Pa., a small village on the Schuylkill River, Chester County, 24 miles west of Philadelphia. The American army of about 11,000 encamped there on December 17, 1777, after the battles of Brandy-

wine and Germantown. The place was chosen partly for its defensibility and partly to protect Congress, then in session at York, Pa. Many of the men died from exposure because of inadequate supplies. Here Baron Steuben disciplined and reorganized the army. From this camp Washington reoccupied Philadelphia in June of 1778. In 1893 Pennsylvania appropriated $25,000 towards making Valley Forge a state park, but the project was dropped because of the inadequacy of the fund.

Vallombro'sa, a celebrated abbey of Tuscany, situated among the Apennines in a valley surrounded with forests of fir, beech and chestnut trees. Here an Order of Benedictine monks was founded about the middle of the 11th century, who were called Vallombrosians from the name of the site. This monastery was suppressed in 1863, and its buildings used for a royal academy of forestry, but it is still much visited by artists and tourists.

Valois (*văl'wä'*), **House of,** a branch of the Capetian dynasty, which occupied the throne of France from 1328 to 1589, when it was succeeded by the house of Bourbon. It comprised the following princes: Philip VI, John the Good, Charles V, Charles VI, Charles VII, Louis XI, Charles VIII, Louis XII, Francis I, Henry II, Francis II, Charles IX, Henry III. (See articles under these titles.) The Valois monarchs of the early line generally were able rulers, who by valor and wise policy resisted the invasions of the English and firmly established the royal authority over their nobility; but those of the later lines, with the single exception of Francis I, were weak and feeble princes, under whose rule the country was distracted by contests between the nobles and by religious dissensions among the people at large, and only saved from greater calamities by the ability of the ministers of the crown, upon whom the government of the country devolved.

Valparaiso (*văl-pä-rī'sō*), the most important commercial town of Chile (*q. v.*) and



chief port on the west coast of South America, is situated on Valparaiso Bay, on which it has a frontage of four and one half miles. It is 62 miles west from Santiago, with which it is connected by rail. It is also connected with the Transandine Railway, which will give connection with Buenos Ayres, Argentine Republic. Steamship lines connect the city directly with Europe and with Panama. Except for a narrow, level strip along the bay, the site consists of a series of hills from 300 to 1,000 feet in height. The city has handsome government buildings, fine hotel, office and business buildings, extensive wharves and warehouses, 12 parks, ten newspapers, professional and high schools, primary schools and extensive manufacturing establishments of various kinds. Valparaiso has been visited by destructive earthquakes at various times. The latest occurred in August, 1906, when the city was devastated, involving an appalling loss of life and a property loss estimated at $200,000,000. Population 175,000.

Valparaiso, Ind., county-seat of Porter County, 44 miles southeast of Chicago, Ill., is on the Fort Wayne, Grand Trunk and "Nickel Plate" railroads. It is in a fertile farming district, and trades largely in agricultural productions. The chief manufactures consist of dairy-products, machine-shop goods and mica-paint. The town has been made well-known by Northern Indiana Normal School. This was founded in 1874 by Henry Brown for those who can not avail themselves of courses in regular colleges. It has over 5,000 students of both sexes, who obtain board, lodging and higher education for about $125 a year. The secret of the low prices lies in the elimination of the middleman and the purchase of food in enormous quantities at wholesale rates. The college has seven acres of gardens cultivated mainly by the students, and these are housed almost as economically as they are fed. For 22 cents a day students obtain good lodging and excellent meals. From the profits on board, lodging and teaching this school has acquired 50 acres of land, bought or built nine substantial buildings, earned and saved nearly $1,000,000 and formed a faculty of 162 instructors. Common-sense ideas are put to use in the educational work. The institution has $200,000 of productive funds, and in 1907 its income was $295,000. There is a library of 12,000 volumes. The population of the city in 1900 was 6,280.

Vam'bery, Arminius, a distinguished Hungarian traveler and professor of Oriental languages at Budapest, was born in 1832. He has traveled widely in Persia and Central Asia, and published many works narrating his wanderings in Persia, in India, in Bokhara and in Central Asia. His more notable works are *History of Bokhara*, *The Central Asian Question*, *Story of Hungary*, *The Coming Struggle for India* and *Western Culture in Eastern Lands*.

Vam'pire, according to a superstitious belief, which still prevails in some European

countries, a ghost which comes out of the grave at night and sucks the blood of men and women. In the mythology of the ancient Greeks beings of a similar nature existed, called the Lamias. These were beautiful women who allured youths to their embrace in order to feed on their flesh and blood. During the middle ages there was a prevailing belief that all persons who died under the ban of the church were sent forth by the devil at night to destroy other people; and it was thought that the only way to escape these vampires was by digging up their unwashed corpses and burying them.

Van, a fortified town and province of Turkey in Asia, stands near the southeast shore of Lake Van, 140 miles from Erzrum. It is overlooked by a citadel now much dilapidated, but which from its lofty height could easily be rendered almost impregnable. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the caravansaries and the bazaars. Van contains numerous ancient ruins, and cuneal inscriptions are found in which the name of Xerxes frequently occurs. Population 30,000. Lake Van is an inland sea, 80 miles in length and 50 miles in extreme breadth. It is fed by about eight streams, and has no visible outlet. Its waters are salt, and the only fish caught are a kind of sardines, which are salted and exported throughout Asia Minor.

Van Bu'ren, Martin, eighth president of the United States, was born at Kinderhook, N. Y., Dec. 5, 1782. He commenced the practice of law at a very early age, and was elected to the New York state senate in 1812. After filling a number of other offices and taking an active part in the politics of the state, in 1821 he was chosen United States senator. He served a term of six years in that capacity, and was then chosen governor of New York. When General Jackson became president in 1829, Mr. Van Buren was appointed secretary of state, but he resigned the office in 1831 in order to accept the position of minister to England. This appointment being made during the recess of Congress, Mr. Van Buren proceeded to England, but as the senate refused to confirm the appointment he returned home soon after. This rejection by the senate probably caused his nomination and election to the office of vice-president in 1832, General Jackson being re-elected president at the same time. In 1836 he was elected president of the United States, receiving 170 electoral votes out of 283; but, although nominated for a second term by his party in 1840, he was overwhelmingly defeated by Gen. William Henry Harrison, the electoral vote standing for Harrison, 234; Van Buren, 60. Mr. Van Buren was brought before the Democratic national convention of 1844 as a candidate, but his nomination was prevented by the adoption of the rule requiring a vote of two thirds of the delegates to secure a nomination. In 1848 he was the candidate of the Free Soil party, but received no electoral votes. He died at Kinderhook, July 24, 1862.

MARTIN VAN BUREN

Vancou'ver, Can., the largest city in British Columbia. It was founded by James Douglas in 1843. It is situated on Burrard Inlet, and is one of the best deep-water harbors on the Pacific coast. It is the western terminus of the Canadian Pacific Railway; also a terminus of the Seattle and Vancouver branch of the Great Northern Railway. Its population exceeds 60,000 and is rapidly increasing. Steamers for all ports, China, Japan etc., regularly leave Vancouver. Vancouver is destined to be a large city. It is a gateway of world-wide commerce. The first Canadian Pacific Railway steamer arrived at Vancouver from Yokohama in 1887. The surveys of the Canadian Pacific Railway which made Vancouver accessible were begun in 1871. A visitor to Vancouver, noticing wide streets and handsome structures, a score of chartered banks, with vessels from many lands in the harbor and business active everywhere, wonders at the change wrought in a single generation.

Vancouver Island, not the least important portion of British Columbia, which, from its great wealth of natural resources and its commanding position on the Pacific coast, is fast becoming one of the richest and most prosperous districts of the province. Coal-mining and lumbering are the chief industries, and fishing, quartz-mining, copper-smelting, ship-building, whaling and other branches are being rapidly developed. The Esquimault and Nanaimo Railway, running from Victoria to Wellington, serves a section of country which it will be difficult to surpass anywhere in the world for beauty of scenery and natural wealth. There are prosperous agricultural communities along the railway and in the Comox District, and several mines are being developed. There is quite a large area of agricultural land, but it is heavily timbered and costly to clear by individual effort. The Esquimault and Nanaimo Railway Company has arranged for the clearing of large blocks of its land-grant (which consists of about 1,500,000 acres) and it is expected, through the exercise of economical methods in removing the timber, that the company will be enabled to sell the cleared land to settlers at moderate prices.

Vandals, a race of European barbarians who contributed very largely to the overthrow of the Roman empire. They made their first appearance as an historic people in the 2d century A. D., and in the first part of the 5th century, in company with the Suevi, Alani and other German tribes, invaded Gaul and ravaged and wasted it for three or more years. In 429 they crossed the Strait of Gibraltar, 50,000 to 80,000 strong under their leader Genseric, and carried devastation and ruin over northern Africa from the shores of the Atlantic to the frontiers of Cyrene. In 439 Genseric broke the peace which he had concluded with Valentinian III and conquered Carthage, when a new peace was concluded which recognized the authority of the Vandals over northern Africa and also over Sardinia, Corsica and part of Italy. In 455 the Vandals captured Rome and plundered it for several days. The manner in which they mutilated and destroyed the works of art collected in the city has caused the term vandalism to be applied to all similar acts of barbarity. After the death of Genseric his son, Hunneric, cruelly persecuted the orthodox Christians and kept the Mediterranean in almost constant alarm by his piracies. The Vandals continued to occupy northern Africa until 533, when the emperor, Justinian, sent an expedition against them under the great general, Belisarius, with the result that they were completely conquered, and their chieftain, Gelimer, was captured and carried to Constantinople in triumph. Most of the Vandals were then drafted into the Roman army and "used up" in the wars with Persia, the few who remained in Africa rapidly disappearing among the natives.

Van'derbilt, Cornelius (commonly called Commodore Vanderbilt), was born on Staten Island, N. Y., May 27, 1794. At the early age of 16 he showed signs of his genius and enterprise by running a boat of his own between New York and the island, and at 23 had accumulated nearly $10,000. In the year 1817 he associated himself with Thomas Gibbons in running the first steamer between New York and New Brunswick, N. J., serving as captain for several years. In 1829 he withdrew from the management of Gibbons' steamers, and for more than 20 years afterward built and operated steamers of his own from New York to various points, all of which proved very profitable. In 1851 he established a line from New York to San Francisco, which he sold to a company of which he himself became president two years later. During the Civil War he presented the government with his finest steamship, *The Vanderbilt*, which cost nearly $1,000,000, and about the close of the war withdrew his capital — amounting to many millions — from steamships and invested it in the stock of various railroads. He soon had control of the New York Central, the Harlem, the Erie and other roads, all of which he conducted with consummate ability and made more and more profitable. In 1873 he gave $1,000,000 to the endowment of Vanderbilt University at Nashville, Tenn., for the education of southern youth. He died at his home in New York, Jan. 4, 1877, having bequeathed the bulk of his estate to his son, William H. Vanderbilt.

Vanderbilt University, a coëducational institution founded in 1872 at Nashville, Tenn., as the Central University of the M. E. Church South, the name being changed to its present one in the following year, in honor of Cornelius Vanderbilt's gift of a million dollars to it, since supplemented by other monetary donations from members of the Vanderbilt family and by contributions from the Nashville citizens. It has a fine equipment in buildings, laboratories etc., besides college-grounds 75 acres in extent. The university prepares for the bachelor's degree in arts, divinity, law, engineering and science; for the M. A. degree in arts, science and pharmacy; and for the doctor's degree in philosophy, science and medical and dental surgery; besides courses with degrees in civil, mechanical and mining engineering. Its teaching staff, with the faculty, numbers 111; while in 1907 it had an attendance of 884 students.

Vanderlyn (*văn'dĕr-lĭn*), **John,** an American painter, was born at Kingston, N. Y., Oct. 15, 1776, and, after taking lessons in painting from Gilbert Stuart, visited Paris at the age of 20 and studied his art in that city for a number of years. He returned home in 1801, but in 1803 made another journey to Europe, where he remained till 1815. Among his works executed while in Europe were *The Murder of Jane McCrea by the Indians* and *Marius sitting among the Ruins of Carthage*. His *Landing of Columbus* can be seen in the rotunda of the national capitol, and his portrait of *Washington* in the hall of the house of representatives. He died at Kingston, N. Y., Sept. 23, 1852.

SIR ANTHONY VAN DYKE

Van Die'men's Land. See TASMAN'IA.

Van Dyke or **Van Dyck, Sir Anthony,** was born at Antwerp, March 22, 1599. It is said that his talent for painting was fostered by his mother, who painted landscapes and was highly

skilled in embroidery. After making considerable progress under Van Balen, he became a pupil of Rubens at the age of 16, who was not slow to discover his remarkable genius. In 1621, by advice of Rubens he visited Italy, remaining there five years. In 1632 he came to England on the invitation of the earl of Arundel, where a pension of $1,000 a year was settled on him. He died at London in 1641, leaving property to the amount of $100,000. It was only 20 years from the time when Van Dyke left the studio of Rubens until his death; and in that short period nearly 1,000 pictures of various kinds were executed by him. His best known works are representations of the crucifixion.

Van Dyke, Henry Jackson, D.D., LL.D., American author and preacher, was born at Germantown, Pa., Nov. 10, 1852, and graduated at the Brooklyn Polytechnic Institution, and Princeton College and Theological Seminary. After taking a post-graduate course at Berlin University, he entered the ministry and held the charges successively of the United Congregational church at Newport, R. I., and of the Brick Presbyterian church, New York. The latter charge he resigned in 1899, to accept the Murray chair of English literature at Princeton University. In 1889 he was appointed preacher to Harvard University, and in 1893 delivered the Lyman Beecher lectures on preaching at Yale. He also delivered a memorial ode at the 150th anniversity of Princeton University, of which he is a trustee. He has been a contributor to many of the contemporary magazines, and taken active part in religious work among the colleges. His writings embrace *The Poetry of Tennyson*, *The Reality of Religion*, *The Story of the Psalms*, *The Christ-Child in Art*, *The Gospel for an Age of Doubt*, *Straight Sermons to Young Men*, *The Ruling Passion* and *The School of Life*.

Van Hise, Charles Richard, American geologist and author, was born at Fulton, Wis., on May 29, 1857. He studied at the University of Wisconsin, and in 1879 graduated, after which he became a member of the faculty, acting first as instructor in chemistry and metallurgy, then as professor of metallurgy and petrology, and finally was elected president of the institution. While acting in the latter capacity, he accepted the post of non-resident professor of structural geology in the University of Chicago, and later served as assistant on the Wisconsin State geological survey and subsequently became consulting geologist to the survey. He was also a member of the United States Geological Survey, and took charge, in 1888, of its operations in the Lake Superior district. Two years later he was appointed geologist in charge of the division of the archæan and metamorphic rocks of the United States. He has been made honorary member of a number of foreign scientific societies, as well as member of the National Academy of Sciences, and editor for a time of his own department of the *Journal of Geology*. His published works, exclusive of his contributions of scientific periodicals and addresses, embrace *Principles of North American Pre-Cambrian Geology*, *Some Principles Controlling the Deposition of Ores* and *A Treatise on Metamorphism*.

Van Horne, Sir **Wm. Cornelius,** K. C. M. G., president of the Canadian Pacific Railroad since 1888, was born in Will County, Ill., Feb. 3, 1843, and entered railway service in 1857. After filling various junior posts, he rose to be general superintendent of the Chicago and Alton and subsequently of the Chicago, Milwaukee and St. Paul Railroad. In 1884 he became general manager of the Canadian Pacific Railroad, and in 1888 was elected to the presidency of the road. He was knighted in 1894.

Vanil'la, the generic as well as the common name of plants which yield the aromatic extract of commerce. The genus is a member of the orchid family, and is native to Mexico and Brazil, and is cultivated in various tropical countries. The aromatic extract is obtained from the long pods, known as vanilla beans, and their seeds.

VANILLA

Van Rensselaer (*văn rĕn' se - lēr*), **Stephen,** known as "the Patroon," an American statesman, was born at New York, Nov. 1, 1765. He was educated at Princeton and Harvard Colleges, and married a daughter of Gen. Philip Schuyler, a distinguished officer of the Revolutionary War. He early gave his attention to politics, and in 1795 was elected to the New York legislature, afterwards becoming lieutenant-governor and canal commissioner. At the beginning of the War of 1812 he was in command of the state militia, and led the assault on Queenston; but the refusal of a portion of his troops to cross the Niagara River enabled the British to repel the attack, and Van Rensselaer retired from the service in disgust. At his own cost he employed Professors Eaton and Hitchcock to make geological surveys of a large portion of New York and New England; he also employed Professor Eaton to deliver geological lectures throughout the state. In 1824 he established an institution at Troy for the education of teachers, with free pupils from every county in the state. About this time also he entered the lower house of Con-

gress, and served several terms in that body with honor and distinction. He died at Albany, N. Y., Jan. 26, 1839.

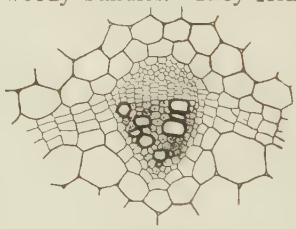
Vane, Sir **Henry,** was born at London in 1612, and was educated at Oxford, where he appears to have embraced the republican principles for which he became so famous. His travels in France and Switzerland strongly confirmed him in his opposition to the Church of England; and in 1635 he sailed for New England — the refuge of freedom-loving spirits in those days. He was chosen governor of Massachusetts, but his supposed heretical opinions soon destroyed his popularity among the Puritan settlers, and after a residence of a year or two in the new colony he returned home and entered upon a political career. When the war between Charles I and Parliament broke out, no man was more active among the leaders of Parliament than Vane. In 1646 Vane was one of the English commissioners for the preservation of peace with Scotland, and in 1648 was appointed to negotiate with Charles I at the Isle of Wight. But he did not view with satisfaction the increasing power of Cromwell and the army, and was strongly opposed to the execution of the king. His views as to the rights and powers of Parliament brought him into pretty sharp conflict with Cromwell, who is said to have exclaimed, when he dissolved his Parliament in 1653: "The Lord deliver me from Sir Harry Vane!" When the restoration of Charles II took place, Vane was one of the 20 persons exempted from the act of general amnesty; and in July, 1660, he was arrested and committed to the Tower. Two years later he was brought to trial at London, and, although he defended himself with great ability and eloquence he was found guilty and condemned to death. In response to a petition that Vane's life should be spared, Charles wrote to Clarendon, declaring that he is "too dangerous a man to let live, if we can honestly put him out of the way." He was accordingly beheaded on June 14, 1662.

Var'nish, a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such a consistency as to be thinly and smoothly spread over the surface intended to be varnished, so that, when it dries, it will leave a thin, resinous coating, which is either glossy or can be made so by mechanical polishing.

Var'ro, Mar'cus Terentius, "the most learned of the Romans," was born at the Sabine town of Reate in 116 B. C., and received his education first under Præconinus and then under Antiochus, a philosopher of the Academy. He served with distinction against Mithradates, king of Pontus, and also against the Mediterranean pirates, but afterwards, as legate of Pompey in Spain, he was compelled to surrender his forces to Julius Cæsar. He continued to share the fortunes of Pompey till after his defeat at Pharsalia, when he was pardoned by Cæsar and employed by him to collect and arrange the great library designed for the public. When the second triumvirate was formed by Antony, Lepidus and Octavian, his name was on the list of the proscribed, but, after some time spent in concealment, he was received under the protection of Octavian, and the remainder of his life was spent in the prosecution of his studies. He died in 28 B. C. Varro was not only the most learned of the Romans, but the most prolific Roman author. He himself confesses to have written no less than 490 books; but only two have survived, and one of these only in a fragmentary state.

Vasari, Giorgio (*jōr'jō vä-zä'rē*), an Italian architect, painter and writer, was born in Tuscany in 1511, and died at Florence in 1574. He studied under Signorelli, Michael Angelo and Sarto. He had great architectural ability, and his Arezzo church and Uffizzi palace stand beside the best buildings of their time. His paintings, however, have every fault of the late Florentine style. His *Lives of Painters, Sculptors and Architects* have great value and singular charm, though he made many mistakes about the earlier artists and perhaps was prejudiced in favor of his fellow-Tuscans. The work has frequently been translated and is delightful reading.

Vas'cular Bundles (in plants), often called woody bundles. They form the great conducting systems of fern-plants and seed-plants, by means of which water with whatever it contains in solution passes from the roots which absorb it to the leaves which use it; and by which elaborated materials pass to points of use and storage. The movement of water from roots to leaves is commonly spoken of as the ascent of sap (but see WATER, ASCENT OF). This great conducting system, composed of vascular bundles, is found only in fern-plants and seed-plants, which are often called vascular plants to distinguish them from moss-plants and thallus-plants, which do not possess vascular bundles. Each bundle consists of two distinct regions: (1) xylem or wood, that which contains the tracheæ or tracheids (see both); and (2) phloem or bast, that which contains the sieve-vessels (*q. v.*). The xylem is concerned in the water conduction and the phloem in food conduction. In an ordinary tree the whole wood-mass is an aggregate of xylem tissue, while the



A COLLATERAL VASCULAR BUNDLE

fibrous inner bark is the phloem tissue (see BARK). Different types of bundles are distinguished by the arrangement of their xylem and phloem masses with reference to one another. Those bundles, in which the xylem and phloem lie side by side on the same radius, the phloem always being on the outside, are called collateral bundles, and are characteristic of the stems of seed-plants. Those in which the xylem is completely surrounded by the phloem are concentric bundles, and are characteristic of the stems of fern-plants. Those in which the xylem and phloem alternate with each other around a common center are radial bundles and are characteristic of all roots.

Vases form a very ancient class of vessels, used formerly for domestic purposes but now chiefly for ornamentation. Usually they are circular in shape, have one or two handles, and are hollow within, and variously decorated without. In architecture, however, vases need not be hollow. The ancient Greek vases found in catacombs throughout Sicily, southern Italy and Greece were used to receive the ashes of the dead. Such vases are usually of pottery, though some have been found of metal, ivory and bronze. The study of ancient terra-cotta vases has shed a great deal of light upon Greek and Roman life; but unfortunately the Egyptian vases are upon the whole of little interest, perhaps because good clay was so abundant in Egypt that it cheapened the art of pottery. The oldest Greek vases are marked by geometrical patterns. At a later stage plants and animals are used in decoration. A finer clay and a more lustrous pigment indicate the progress of the art. The greatest masters of pottery were the Athenians, who in the 6th century B. C. invented a brilliant black glaze, used for figures upon a red ground. At a later stage the Athenians frequently depicted red figures upon a black ground. A period of decadence in the potter's art appears to have begun in Athens as early as the fourth century B. C. The vases of Sicily and southern Italy were more gay and less classic than those of Athens.

Among the Greek vases the type best known perhaps is the *amphora*, in which oil and wine were kept. The *pithos* was a large and comparatively coarse vase for grain or the cheaper fluids. The *hydra* was a water-pitcher which possessed an extra handle for pouring. The *crater* was a bowl from which wine was served to the company at table. The *cylix* is a very shallow, broad cup. The figures upon these and other Græco-Roman vases reveal to the modern observer scenes from the myths, the industries, the festivals, the ceremonies and the sports of ancient life. The Portland (*q. v.*) vase in the British Museum is one of the most famous examples. The workmanship of this vase is peculiar, for it is constructed of two layers of glass, of which the outer and opaque layer is cut down in such a way that figures are left standing, cameo-fashion, upon the inner layer as a ground. See POTTERY.

Vas'sar College, founded by Matthew Vassar, the first well-equipped institution for the higher education of women, is two miles east of Poughkeepsie, N. Y. It was incorporated in 1861 and opened in 1865. In the same year Mr. Vassar transferred to the trustees a farm of 200 acres, on which the college was to be built, and other property, the whole amounting to $400,000 in value. He increased this sum by other large gifts during his lifetime, and on his death bequeathed $400,000 more. It has also been pecuniarily aided by Mr. Vassar's nephews In accordance with the wish of Mr. Vassar some of the instructors are men and some are women. The buildings are the main building, modeled after the Tuileries, observatory, laboratory, museum, conservatory, gate-lodge, gas-works, boiler and pump houses and farm-buildings. The library contains 60,000 volumes, and the gymnasium, observatory and laboratory are finely equipped, while the conservatory was added for assistance in the study of botany. It has also a collection of paintings and casts of models. There are 210 acres in the grounds, forming a beautiful park, with a lake for boating and skating. Besides the regular course for the degree of A. B., admission to which requires the same examinations as entrance to the leading colleges, there are schools of painting and music. In 1908 there were 95 instructors and 1,000 students; and the college is steadily growing in size and in influence. To-day its annual income is close upon $490,000; while the amount of its productive funds is $1,312,600. The value of its chief buildings and residences at present exceeds two million dollars. The college offers its students four fellowships, six or seven graduate scholarships, besides a number of undergraduate scholarships.

Vassar, Matthew, American philanthropist and founder of Vassar College, was born in Norfolk County, England, April 29, 1792, and four years later accompanied his father to America, where he settled on a farm near Poughkeepsie, N. Y., his father establishing a brewery in that city. Young Vassar subsequently succeeding his father in this interest, he decided in 1845 to apply a portion of the profits derived from it to the endowment of a school for the higher education of women. This purpose he put into effect in 1861, by donating $400,000 to the institution in Poughkeepsie that became known as Vassar College. The success of the institution was gratifying and immediate. On Matthew Vassar's death in June, 1868, he provided in his will for a further donation of $400,000 to Vassar. The in-

stitution has been since enriched by large sums donated to it by the nephews of Matthew Vassar, and to the endowing of memorial chairs, aiding the Literary and Scientific institute attached to the college, to Vassar Brothers' Hospital and to the Home for Aged Men in Poughkeepsie.

Vatican (*văt'ĭ-kăn*), the residence of the pope and the seat of the great library, museums and collections of art, ancient and modern, which constitute one of the chief attactions of Rome for all visitors. Although the earlier popes had a residence in the Vatican, it is probable that no part of the present edifice is older than the pontificate of Nicholas V, who in the 15th century began the plan of improvement and embellishment of the Vatican which has made it the noblest of princely residences. Alexander VI, Julius II and, above all, Leo X pursued the same plan; and nearly all the succeeding popes have had some share in the enlarging of the building. Amid all the difficulties, financial and political, of his pontificate Pius IX made numerous improvements to the palace, the most striking being the great stair by which it is approached from the colonnade of St. Peter's. The building with its garden and appurtenances is said to cover a space equal to the whole area of the city of Turin, such as it was 30 years ago, with its 130,000 inhabitants. It contains several thousand separate rooms or apartments, some of them of unrivaled beauty and elegance. Among these may be specially mentioned the chapel of San Lorenzo, the Pauline chapel, the Sistine chapel, decorated in frescoes from the brush of Michael Angelo, the galleries and halls decorated by Raphael, Giulio Romano and their scholars, the magnificent library, the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases and other objects of art.

Vatican, Council of the, the great ecumenical council of the Roman Catholic church in 1869-70, at which the doctrine of papal infallibility was formally promulgated. This council, composed of Roman Catholic prelates — some 750 in number — from all parts of the world, convened in the Vatican palace on Dec. 8, 1869, and closed its deliberations on Oct. 20, 1870, when this dogma was adopted by a practically unanimous vote. As formulated at the council, it contains the following propositions: (1) That a proper primacy or jurisdiction over the whole church was conferred on St. Peter directly, and not mediately through any delegation authorized by the church as a whole; (2) that this primacy rests by divine institution in the line of Roman pontiffs as St. Peter's successors; (3) that the pope's jurisdiction is immediate in all churches, all other bishops being merely his curates and deputies; so that not only on questions of faith and morals, but on questions of discipline and order the entire church, both priests and laymen, are bound to submit to his authority; (4) that it is unlawful to appeal from the pope to an ecumenical council as a higher authority; (5) that the pope, when he speaks *officially* and defines a doctrine of faith or morals to be held by the universal church, is infallible, and his utterances are not to be modified or changed.

Vaudois (*vō'dwä'*). See WALDEN'SES.

Vaughan (*vawn* or *vau'un*), **Herbert,** Cardinal, English Roman Catholic prelate and the successor of Cardinal Manning as archbishop of Westminster, was born at Gloucester, England, April 15, 1832, and received his education at Stonyhurst College and at Rome. He was ordained a priest at Lucca in 1854, and returning to England he joined the Oblates of St. Charles at Bayswater. He then became vice-president of St. Edmund's College near Ware, and in 1869 founded and became president of St. Joseph's Foreign Missionary College, Middlesex, and three years later accompanied to Maryland a detachment of priests on a special mission to the colored people of the United States. In 1872 he was consecrated to the bishopric of Salford, and 20 years later was transferred to the see of Westminster. In 1893 he was created a cardinal of Rome, and two years later he laid the foundation stone of Westminster (R. C.) Cathedral, a vast and stately edifice in the Byzantine style, erected in London. In 1897 the cardinal took part in the celebration by the Roman Catholics of England of the 13th centenary of the landing of St. Augustine in Britain.

Vault, an arched roof, usually constructed of stone or brickwork. The simplest kind of vault is the semicircular arch extending from one end of an apartment to the other. Ordinary bridges are an example of this style of vaulting, which was commonly used by the Romans, who also built vaults with groins, that is, vaults intersecting one another. The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are among the Romans. The Roman vaults, when groined, were usually constructed with carefully cut stone, so as to prevent the angle from chipping; but the medieval architects had not the costly materials or skill of the Romans at command; so they formed only the groins of dressed stone, and filled in the vault with more common material. This led to the groins becoming a prominent feature in medieval architecture, moldings and carvings being used for ornamentation. In modern architecture vaults and arches are gradually being superseded by the use of iron constructions, both for roofs and for supporting floors, bridges etc.

Vauxhall (*vâks-hâl'*), a famous public garden in London, established immediately after the Restoration in 1660 and continuing for nearly two centuries. It was situated in Lambeth, opposite Milbank and near the manor called Fulke's Hall, from which it derived the name of Vauxhall. The loose character of the amusements it afforded is freely sketched by the novelists and dramatists of the last century, and is further sketched in Thackeray's *Vanity Fair.*

Vec'tor is a term employed by mathematicians to denote a directed magnitude, that is, a quantity which has both direction and magnitude.

As examples of vector quantities may be mentioned the distance between any two given points, a velocity, a force, an acceleration, angular velocity, intensity of magnetization flux of heat.

Quantities, such as a quart of water, a pound of sugar, temperature, a quantity of energy, which do not have direction, are called *scalars.* See Maxwell's *Matter and Motion* and Tait's *Newton's Laws of Motion.*

Veda (*vā'dȧ* or *vē'dȧ*), (literally, *knowledge*) is the name of those ancient Sanskrit works on which the first period of the religious belief of the Hindus is based. The oldest of these works is the *Rigveda;* next to it stand the *Yajurveda* and *Samaveda;* the fourth and latest being the *Atharvaveda.* The first three bear the collective title of *Trayi,* the threefold, and all four are considered of divine origin. Each of these Vedas consists of two distinct divisions — a *Sanhita* or collection of *mantras* or hymns and a portion called *Brahmana* A *mantra* may be defined as a prayer or thanksgiving addressed to a deity in one form or another. If such a *mantra* is metrical and intended for loud recitation, it is called *rich,* from *rich,* praise — whence the name *Rigveda;* if it is in prose it is called *Yajus,* from *yaj,* sacrifice, — therefore *Yajurveda* signifies the Veda containing such sacrifices. And if it is metrical and intended for chanting, it is termed *Saman* — hence *Samaveda* means the Veda containing such *Samans.* No special name is given to the *mantras* of the fourth Veda. Though the *mantras* and *Brahmanas* are both said to have existed from all eternity, there is abundant evidence that the *Brahmana* portion of each Veda was written some time after its *mantras,* for it refers to them, and it seems almost self-evident that both portions must have been the work of considerable time.

Ved'der, Eli'hu, an American painter, was born at New York City, Feb. 26, 1836, and after studying his art for some years both with Matteson and in Europe, opened a studio in his native city, where he won high reputation as a *genre* painter. He afterwards returned to Europe and took up his residence at Rome, where he is now living. Among the pictures which rank him high as an artist may be mentioned *The Lair of the Sea-Serpent, The Monk upon the Gloomy Path, African Sentinel* and *The Last Sun-Worshipper.*

Vega-Carpio (*vā'gȧ kär'pē-ō*), **Lopé Felix de,** a celebrated Spanish poet, was born at Madrid, Nov. 25, 1562. From his infancy he is said to have given promise of extraordinary talent. Like Pope he "lisped in numbers." He was the idol of his time, and in productiveness at least surpassed all other poets, his dramas alone numbering 1,500 to 1,800, and in view of the quantity of his work its quality is no less surprising. The ease and grace of his versification are unsurpassed in the Spanish language, and his works are all instinct with life and dramatic movement. He is deficient in deep and serious qualities; but, notwithstanding this defect, he remains the chief ornament of the Spanish drama and a considerable figure in the dramatic literature of the world. The dramatist is generally referred to as Lope de Vega. He died at the home of his birth, Aug. 27, 1635.

Veii (*vē'yī*), an ancient city of Etruria and in early times the rival of Rome. Its very site is disputed, but it is now generally thought to be at Isola Farnese, about 12 miles from Rome. The struggle between the two cities is represented by Roman historians as commencing during the time of Romulus and continuing under all the other kings, except Numa, generally to the advantage of the Romans. At last the Romans determined to rid themselves of a rival by a siege, and persevered with great tenacity, although the city held out for ten years, and frequent attempts were made by neighboring states to relieve it. It is said to have been finally taken by means of a mine which was directed into the citadel. The citizens were massacred or sold as slaves, and the land confiscated by the conquerors. The fall of Veii took place in 396 B. C., and after its fall it was gradually deserted. In later times a colony was planted there by Julius Cæsar and afterwards by Augustus, but it always remained an insignificant place.

Veins (in plants) are the extension of the vascular system into the leaves. See VENATION.

Velasquez (*vȧ-läs'kȧth*), **Diégo Rodriguez de Silva,** one of the most famous of Spanish painters, was born at Seville in June, 1599. At an early age he was placed in the studio of Francisco Herrera el Viejo, and afterwards became the pupil of Francisco Pacheco, whose daughter Juana he married. In 1622 he visited Madrid, and while there painted so fine a picture of King Philip IV that he at once became famous and secured the royal favor and patronage, which continued to the end of his life. In 1629 per-

mission was granted Velasquez to visit Italy, where he was received with the highest honor, Pope Urban VIII assigning him apartments in the Vatican. In the spring of 1631 he returned to Madrid, where he was cordially welcomed by his royal patron. He had a room assigned to him in the royal palace and the king would often visit him and watch him at his work. Additional honors were conferred upon him by the king from time to time until his death, which took place on Aug. 7, 1660, his wife, who was passionately attached to him, surviving his loss only about a fortnight. With the possible exception of Murillo, Velasquez takes the highest rank among Spanish painters.

Veloc'ity. See DYNAMICS.

Vel'vet, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill-weaving, there is an additional weft, consisting of short pieces of silk, cotton or woolen thread doubled under the regular weft and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterwards cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

Vena'tion, the arrangement of veins in leaves. The details of this arrangement are endless, but they may be reduced to two principal types. The two main types are known as closed and as open venation. In the former case, while the veins branch, they always run into one another, never having tree ends among the leaf-cells or in the leaf-margins. As a consequence, such leaves have even outlines, that is, they are not toothed or lobed. A very common form of the closed venation is that in which the main veins run parallel from base to apex, as in the grass-blade, and leaves of other monocotyledons. Such leaves are called parallel-veined. In other cases of closed venation, as in palms, bananas etc., the main veins are not parallel. The closed venation is characteristic of the monocotyledons. In open venation, characteristic of dicotyledons, the ultimate branches end freely, either among the leaf-cells or in the leaf-margins. Such leaves are said to be net-veined or reticulate, and they are much inclined to become toothed, lobed or compound. There are two forms of open venation: pinnate or feather-veined leaves, in which there is a main central vein or rib (midrib), from which the whole vein system arises; and palmate leaves, in which three or more main ribs rise together at the base of the leaf, and diverge upward. In the ferns the venation is open, but the veins fork repeatedly, such a venation being called dichotomous.

Veneer', a layer of wood cut very thin for the purpose of being glued to the surface of a more common kind. Only choice kinds of hard wood are sawed into veneers, and they are usually attached to pine or some other kind of soft wood, so as to give all the apperaance of being made solid. In this way the more costly kinds of furniture-woods are economically used by the cabinet-maker; for, with the improvements that have been made in the process of sawing, veneers as thin as paper can be produced.

Venezuela (*vĕn'ĕ-zwā'lā*), a republic of South America, lies between the Caribbean, the Atlantic, Guiana, Brazil and Colombia. Area 364,000 square miles, a third more than that of Texas, nearly two times that of France. Capital: Carácas (72,429). Population 2,619,218.

Surface and Drainage. Venezuela consists of mountainous lands in the north, 300,000 square miles of plains in the center and vast plateaus in the south. The most important ranges are the Merida, a continuation of the Colombian Andes, and two ridges paralleling the Caribbean and called the Maritime Andes. Between these lies a fertile valley, the densely peopled part of Venezuela. The low plains are grassy, pasturing large herds, the high plains timbered. The tableland along Brazil and Guiana breaks into numerous ridges and peaks, the Parima and Pacaraima ranges. The drainage is an oceanic system, the Orinoco and its tributaries emptying into the Atlantic, the northern streams into the Caribbean. Over 1,000 rivers exist, almost 500 in the Orinocan system. Seventy rivers are navigable for nearly 6,000 miles, and are open to large steamers the year round. The Orinoco belongs wholly to Venezuela. Rising almost in Brazil, circling 1,450 miles, it is navigable below and above its rapids, and, with navigable affluents, affords 4,300 miles of navigation. The Orinoco and Meta form the shortest route from Europe to the Andes. The Casiquiari and Négro, both navigable, link the Orinoco and Amazon. The coast, 1,584 miles long, provides 32 good harbors. The lakes, numbering 200, are of increasing importance to transportation.

Climate and Rainfall. The mountainous districts and lofty valleys have a temperate climate, the coast and Orinoco valley a tropical one. The wet season experiences heavy rains; the dry season is mild and vivifying. Precipitation occurs most heavily on the coasts, mountains and western plains. At Carácas the mean fall annually is 30 inches.

Resources. These include, as indigenous products, cacao, cinchona, copal, drugs, herbs, rubber and a substitute called balata, sarsaparilla and tonka. Native to Venezuela are 150 building and cabinet woods

and over 20 dye and tan woods. Pearl, sponge and tortoise-shell fisheries have increasing value. Forty-seven minerals occur, comprising asphalt, coal, copper, granite, guano, iron, lead, marble, mercury, petroleum, platinum, precious stones and salt.

Agriculture. Coffee is the principal crop and the basis of Venezuela's wealth. Cacao and cocoanuts are largely grown. Cotton and sugar are grown, but not so extensively as formerly. Manioc and maize form the chief food-crops. The herds rival those of Argentina.

Commerce and Manufactures. Exports exceed $16,000,000, agricultural productions equaling 87% of the exports and coffee being nine tenths of the contribution by agriculture. Imports, about $9,000,000, include bagging, bags, cottons, flour, machinery, provisions, rice and woolens. Manufactures are limited mainly to cheap clothing, coarse cotton, farm-tools, organs, paper, pianos, spirits and sugar. The railways cover 540 miles, 382 being on the seaboard and connecting the larger cities with their ports.

Education. Legislative enactments (1870) provided well for primary instruction, which was made free and compulsory, but primary schools number only 1,330. Eleven national girls' colleges exist. There are professional and technical schools and two universities. Roman Catholicism is the religion of the people, but tolerance for other religions is professed.

History. Columbus discovered the Orinoco (1498), Ojeda the Maracaibo district (1499), naming it Venezuela or Little Venice from an Indian lake-village. Settlement occurred in 1520. Venezuela, through Bolivar, initiated Spanish America's revolt (1811), rising that year, uniting with New Granada and Quito (1819) as one republic, but in 1829 becoming a separate state. Comparative quiet obtained till 1846, but 50 revolutions have since occurred, ten succeeding. Emancipation (1854), encouragement of immigration, opening the Orinoco to navigation by all comers (1886), the influx of $50,000,000 of foreign capital and the settlement of the Guiana dispute with Britain by arbitration (1899) have been the significant events of the half century ending with 1902. Cipriano Castro is the president now. His administration has been marked by ceaseless difficulties with European powers and the United States.

Venice (*vĕn'ĭs*) or **Venezia,** a city of northern Italy, is built upon a crowded cluster of islets in the lagoon of Venice, which is separated from a gulf of the Adriatic by a long and narrow sandbank, divided into a number of small islands by six narrow sea-passages. Inside of this sandbank and between it and the mainland, about four miles distant, is the lagoon, in some parts of which islets have formed, firm enough to be built upon and fertile enough to be cultivated. Here the city of Venice is built. As the islands in many places afford no suitable foundations for buildings, the city is largely built upon piles or stone. In the vicinity of Venice the ebbing tide lays bare a great plain of mud, laced by a network of narrow channels from which the sea

never retires, while at high water the whole surface is covered by the sea to the depth of one or two feet. The city of marble palaces seems to rise like a vision out of the sea. This alone suffices to make it at all times an object of fascination, but in summer and autumn, the season of the highest tides, when the grand place of St. Mark's is partially flooded, the city is marvelously beautiful, and must continue to be a place of interest so long as it stands. The present population is 151,840. Although the many marshy islands extending along the northwestern shores of the Adriatic are known to have been used by the inhabitants of Venetia, one of the provinces into which Italy was divided by Constantine, as places of retreat from barbarian invasions as early as the 5th century, the first permanent settlement on the site of the present city cannot be traced farther back than the beginning of the 9th century. The physical conditions with which the early inhabitants had to contend could hardly have been more unfavorable to the development of a great and prosperous city. The soil possessed no kind of mineral wealth, the thickets which diversified the surface of the barren marshes produced no valuable timber, good drinking-water was hardly to be obtained; yet it was here that the Venetians by their energy, their industry and their genius for commerce succeeded in establishing and maintaining their independence, in making other nations their tributaries, in sending their fleets to distant shores, in controlling the destiny of empires and in building up a naval power

unique in history. Venice may be said to have risen out of the ruins of the Roman empire and to have maintained its separate nationality through the middle ages and down to 1797, when Napoleon Bonaparte entered the city, proclaimed the republic at an end and transferred her territory to Austria. In 1806 the city with the territory of Venetia was annexed to Italy by the treaty of Pressburg, but it was again transferred to Austria in 1814, under whose dominion it remained until 1866, when it was once more incorporated in the kingdom of Italy. Consult Brown's *Venice*, McClellan's *Venice* and Oliphant's *Makers of Venice*.

Venice, Gulf of, that portion of the Adriatic Sea which indents the Italian province of Venetia to the extent of 50 or 60 miles.

Ve'nus, the Roman goddess of love, subsequently identified with the Greek Aphrodite. Originally, Venus does not seem to have occupied a conspicuous place in the religion of the Romans, and she scarcely figures in the history of Rome under the kings; but gradually, as the myth of the Trojan origin of Rome gained ground, the worship of Venus emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became Venus. Ares was Mars, and Mars was the national god of the Roman people; then, as in Greek mythology Aphrodite was beloved of Ares, so Venus was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April — the springtime of the year being thought favorable to the growth of the tender emotions.

Venus. See PLANETS.

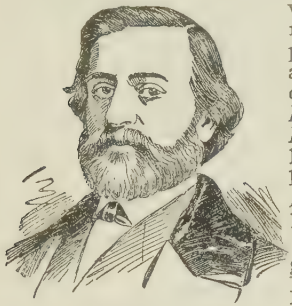
Vera Cruz (*vā'rȧ krōōs*), an important city on the eastern coast of Mexico, about 200 miles east of the City of Mexico, with which it has communication by railway. It is built in a semicircle facing the sea, the streets, which are wider than is usual in tropical countries, running east and west from the harbor, with others crossing them at right angles. The town is defended by a wall six feet in height and other substantial works, and also by the castle of St. Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. Although Vera Cruz is the chief port of Mexico, it has no harbor worthy of the name, only an open roadstead between the castle and the town. The anchorage is so bad that, when the north gales prevail, many vessels are wrecked on the adjoining shore. The chief exports are precious metals, cochineal, sugar, flour, indigo, leather, vanilla etc.; and the chief imports cotton, woolen, silk and linen goods, brandy, iron, hardware and earthenware. Vera Cruz was bombarded and taken by General Scott during the Mexican War and by the allied British, Spanish and French squadrons in 1861, when they sought to set Archduke Maximilian of Austria upon the throne of Mexico (*q. v.*). Population 29,164.

Verrazano (*vĕr'rät-sä'nō*), **Giovanni da** (1480–1527), Florentine navigator, on much of whose exploratory work in the New World doubt has been cast. Moreover, little is authentically known as to his early career, some authorities relating that even the name he passed under was not his own; while, so far from serving his country, it is stated that he was a corsair in the service of France and, as such, preyed upon Spanish and Italian commerce. His first voyage of discovery, it is believed, was undertaken in the service of Francis I of France. Under a commission from the monarch he commanded an expedition in 1524 to the New World, which explored its coasts from Cape Fear southward and then northward to Newfoundland, touching at ports on the coast of Nova Scotia and Cape Breton and entering also, it is understood, New York and Narragansett Harbors. Verrazano's expedition northward, we know, gave a claim, though possibly a shadowy one, of first discovery of a vast region to France, under whose authority he sailed and that ten years before the voyage to the Gulf of St. Lawrence of Jacques Cartier of St. Malo. Of Verrazano's later career, on his return to France, little also is definitely known. Some biographers assert that in 1525 he took part in the battle of Pavia, and for a time was a prisoner of the Spaniards. For critical discussion of authorities consult Winsor's *Narrative and Critical History of America*.

Verbe'na, a numerous species of annual herbs or shrubs, common in the gardens of the United States, though native to tropical or semitropical America. The cultivated varieties usually are propagated from seeds, though they are also found growing as weeds in waste ground. They grow best on a high, garden soil, when well-fertilized. The verbena flowers showily and in varied colors (chiefly lilac, purple and white pink) on slender spikes, some varieties having a sweet scent, especially those native to Brazil. The plant is frequently used in medicine as a cooling remedy.

Verdi (*vĕr'dē*), **Giuseppe,** Italian operatic composer, was born at Rancole in the duchy of Parma in 1814 and received his musical education at Milan. His first work was a musical drama, which appeared in 1839, and he produced a number of operas, which, while they abound in melody and striking dramatic effects, are characterized by noisy orchestration. In 1861 he was elected to

Parliament, and in 1875 was made commander of the French Legion of Honor. He was also decorated by the emperor of Russia and by the khedive of Egypt. *Il Trovatore* and *La Traviata* perhaps are his best-known operas. *Falstaff*, his latest production, was first given at Milan, Feb. 9, 1893, attracting visitors from all over Europe, the seats being sold at $50 each. Verdi died at Milan, Jan. 27, 1901.



GIUSEPPE VERDI

Verestchagin (*vyĕ'rĕshchä'gĭn*), **Vasili,** a Russian battle-painter, was born at Novgorod, Oct. 26, 1842. In 1867 he was a soldier in Turkestan, and in 1877-8 in the Russo-Turkish war, in which he was wounded. He produced numerous paintings, many of them scenes in East India, while others are war-sketches. A collection of his pictures has been exhibited in New York, Chicago and other American cities. He died on April 13, 1904.

Ver'gil, Publius Vergilius Maro, a Roman poet, was born on Oct. 19 of 70 B. C. at Andes, near Mantua, Italy. He studied at Cremona, Milan (then Mediolanum) and Naples, his father, a small landed proprietor, evidently appreciating his son's genius and having him carefully educated. He was not a Roman citizen by birth and does not seem to have aspired either to military or to political distinction. When the lands of the country were seized for the benefit of the army, his father lost his small farm, but it was restored by Vergil's influence with Pollio and the young Octavianus (Augustus). He had, however, to escape by swimming across the river from the violence of the soldier who held possession of it. He lived in Rome for a time, where for friends he had Mæcenas, Varius and Horace and afterward at Naples and Sicily, and went with Horace on his famous journey to Brundusium. In 19 B. C. he went to Athens, intending to spend three years in Greece and Asia in perfecting his *Æneid*, which was finished, but met Augustus at Athens and was persuaded by him to return to Italy. He died on the journey, Sept. 21, 19 B. C. at Brundusium. His tomb at Naples was long held sacred and visited as a temple.

His fame rests on three works: the pastoral poems or *Bucolics*, *The Georgics* and *The Æneid*, though a few other poems are thought to have been written by him. *The Eclogues* or *Bucolics* were published in Rome in 37 B. C., and are poems treating of matters of current interest, connecting with them the love of home and of nature. *The Georgics* are said to have been written at the suggestion of Mæcenas, and treat of the life and work of an Italian farmer. The cultivation of the fields, the constellations which serve for a calendar, the signs of the weather. the culture of the olive and the vine, the rearing of herds and cattle and the care of bees are the subjects of the four books. His great work, *The Æneid*, is in 12 books, and gives the history of the wanderings of Æneas and his final settlement in Latium. He had not finished the poem to his satisfaction, and in his last illness is said to have called for the cases that held the manuscript, intending to have it burnt. He also left directions in his will that none of his unpublished writings be given to the world, but the commands of Augustus prevented the loss of this great poem. The Romans were very proud of Vergil and his work; his writings were used as text-books and copied by later poets; while various traditions made him looked upon as almost a magician. Dryden's and William Morris' translations of the *Æneid* are among the best English translations. Consult Sellar's *Roman Poets of the Augustan Age*. See ÆNEAS, HOMER, ILIAD, ODYSSEY and TROY.

Ver'mes or **Worms,** the subkingdom made up of worm-like animals. Under this heading are included an immense number of animals that are so diverse in structure that the very general title of worm is justifiable only as applying to their form or shape. It embraces about a dozen classes whose relationships are imperfectly known. The interest in the group is considerable, because the worms show affinities with the higher animals, including even the vertebrates. All are animals with three cell-layers, a body-cavity and a nervous system consisting of a brain mass, on the dorsal surface, and a ventral nerve-cord divided into joints. The upper and lower parts of the nervous system are connected by a ring of nervous substance that surrounds the throat. From the central nerve-cord are given off nerve-trunks which branch profusely and terminate in minute twigs within the tissues. The digestive system is diverse, the circulatory system is imperfect, and there usually is a set of tubes or *nephridia* connected with excretion. The worms live in the sea and fresh water, in the earth and upon it and as parasites within the interior of the tissues of various animals. They are divided into the jointed or *segmented* worms and the *unsegmented* worms. The former are more generally known and are mostly included under one class, called *annelida*. This class embraces the earthworms, the leeches and a few forms living in the sea. The earthworm series have hair-like bristles (*setæ*) on each joint, which aid in locomotion. The leeches are not

provided with bristles, but have two round suckers, one at either end of the body. Some of the leeches live on fishes, feeding on the mucus which comes from the bodies of those animals; others are bloodsuckers. The latter are provided with sharp jaws, located within the forward sucking-disc, with which they cut the skin of the animals upon which they fasten. The unsegmented worms embrace the flat worms (*plathelminthes*) and the roundworms (*nemathelminthes*). Some of the former class live in the water and moist earth, and others of the same class are internal parasites, like tapeworms. The class of roundworms likewise includes forms living freely in the water and other substances, as horsehair worms and vinegar and paste eels. Examples of parasitic roundworms are the stomach-worms and pinworms of children and the trichina. The latter is the most dangerous of the parasitic worms, getting into the system by eating raw or partly cooked pork. Besides the *annelids*, flatworms and roundworms, there is a fourth class called *molluscoidea*. Under this heading are grouped a few forms that have given naturalists no little trouble to classify. One division of them contains moss-animals (*polyzoa*), both of salt and fresh water. They occur in branching colonies which resemble low plants in general form. The other division includes shelled-worms, called brachiopods, which were formerly included among the mollusks near the clams. See ROTIFER, TRICHINA and VERTEBRATES.

Vermil'ion, a bright scarlet color which is obtained from a native ore called cinnabar, or is made artificially from mercury and sulphur. This compound, sulphide of mercury, is thrown into tall, earthen pots, and the lower parts kept red-hot. The substance volatilizes and coats the pots with cinnabar. The pots are broken and the cinnabar scraped off, ground and dried, when it is ready for use as vermilion. Cinnabar, the ore from which vermilion is obtained, is a compound of sulphur and mercury, of a blood-red color. It is simply ground fine, and then known as vermilion. The most important mines are those of Almaden in Spain, which have been worked for 3,000 years, and of New Almaden in California. There are mines in Brazil, Peru, Austria, Hungary, China and Japan.

Vermont' (from the French *vert mont* — green mountain), a North-Atlantic state of the Union, popularly known as the Green Mountain State, has an area of 9,565 square miles. Its length is 155 and its extreme breadth 90 miles; its northern boundary being the Canadian province of Quebec, its eastern one New Hampshire, its southern one Massachusetts and its western one New York. The Connecticut River separates it from New Hampshire, while its northwestern boundary is chiefly formed by Lake Champlain, which separates it from New York. Its capital is Montpelier (population 6,266). The other chief towns are Burlington (21,070), Rutland (11,961), Barre (11,028), Brattleboro (5,297) and St. Albans (6,239), The population of the state in 1906 was estimated to be 350,393. Vermont was admitted to the federal Union in March, 1791.

Surface and Climate. The main feature of the surface is the Green Mountain range, which traverses it northeast and southwest, and forms the watershed. The range has a number of considerably elevated peaks, at a height varying from 4,001 to 4,364 feet, the latter representing the altitude of Mt. Mansfield. The state's general elevation is between 600 and 1,000 feet, though there are low sections in the valleys, about the lakes and along the rivers. It has a long and generally severe winter, with frequent heavy snowfalls, but the winter is bracing, while the summer usually is bright and pleasant.

Natural Resources. Forests, chiefly of spruce and hemlock overspread the state, but in parts there is considerable agricultural land, though the farms are small, as a rule, and generally devoted to dairy interests and the cultivation of hay, oats, barley and corn. The apple is largely cultivated, and the state extensively produces maple-sugar and maple-syrup. The soil for the most part is poor and stony, though on the hill-slopes there is good herbage for the grazing of cattle, sheep and other animals of the farm. The chief cereals raised in 1907 were 2,652,000 bushels of oats; 1,980,000 of corn; and of wheat about 30,000 bushels. Hay usually is a large crop, as are potatoes; while there is only a fair yield of barley and buckwheat. The number of domestic animals on the farms is 92,721 horses, 293,931 dairy-cows, 225,870 other cattle, 223,078 sheep and 95,874 swine. In 1900 the production of lumber was valued at close upon $7,000,000, but it has since declined to the extent of a million dollars. On the other hand, the mining industries have of recent years improved greatly, particularly granite, marble and other building-stone; also the annual yield from slate, brick and tile.

Manufactures. Vermont makes only an indifferent showing in volume of manufactures; New Hampshire annually has almost double its value of industrial products. In 1905 the manufacturing establishments numbered 1,699, with an aggregate capital of $62,658,741. The wages to 33,106 wage-earners amounted to $15,221,059; while the gross value of the products was $63,083,611. The chief industrial centers are Burlington, Barre and Rutland. Marble, granite and stone-work, including the manufacture of monuments and tombstones, in 1905 made returns of close upon

$5,000,000; lumber, timber, furniture, paper and wood pulp had a total of $12,000,000; foundry, machine-shop and planing-mill products had a return of $6,000,000; the grist and flour mills showed a return in excess of three millions; dairying, including the trade in cheese, butter and condensed milk, produced $6,500,000; while hosiery, woolen and knit goods yielded some $6,750,000 in gross. The other chief industries embrace roofing-materials, scales, balances and patented medicines.

Commerce and Transportation. Vermont's proximity to the Canadian border causes considerable foreign trade in imports and exports. These, in the main, enter by way of Burlington on Lake Champlain and by Newport on Lake Memphremagog. In 1905 the value of the combined imports and exports at Burlington was close upon $13,500,000, and the value of the trade entering and passing out at Newport was about the same. In the same year the state had 50 national banks, with an aggregate capital of $5,750,000 and total deposits amounting to over $14,000,000. The savings-banks numbered 45, with 145,605 depositors and $52,089,698 of deposits. The assessed valuation of real and personal property in 1905 was nearly $188,000,000; the revenue was about $1,500,000, while the expenditure was less by some $300,000. The debt is under $175,000. The railway mileage within the state totaled 1,055 miles in 1905, the principal railroads traversing it being the Central Vermont and the Boston and Maine lines, with the Grand Trunk of Canada.

Education. A superintendent of education has charge of the public-school system, which annually costs over $1,175,000, about three fourths of which are paid for teachers' salaries. The school-population in 1905 was over 78,700, the enrolment being in excess of 65,000, while the average daily attendance was close upon 49,000. The state has a permanent school-fund, and employs about 3,300 teachers, chiefly women. For the training of teachers, beyond the attention given them in the advanced classes of the high schools and academies, there are summer-schools and three state normal schools at Randolph, Castleton and Johnson. At Burlington is the university (founded in 1791) of the state, with an agricultural college attached, which receives state aid. Higher education is also represented by Middlebury College, with 13 instructors and 177 students. The latter is nonsectarian, as is also Norwich University at Northfield, which has 10 instructors and 140 students. Moreover, there are an industrial school for children of both sexes at Vergennes and a soldier's Home at Bennington, the latter receiving federal aid. Vermont also has the usual charitable and penal institutions, besides the hospitals, orphanages and similar institutions maintained by private beneficence.

History and Government. From Vermont's proximity to the French province of Quebec, the region was in early days explored by the French. Lakes Champlain and George are known to have been visited by Samuel de Champlain in 1609, while on an expedition with a band of Hurons, Montagnais and Algonquins against the Iroquois of the region. At first only trading-posts were established in northern Vermont, including stockades, at what now are Crown Point, Ticonderoga and Colchester, at and about which settlements grew in time, though harrassed by the Indians both local and from Canada. Raids from the latter quarter, however, came to an end after the expedition from Crown Point in 1759, led by Major Robert Rogers, against the Saint Francis Indians, who had long been the scourge of the New England frontier. For many years settlement was at a disadvantage owing to the uncertainty of ownership over the region, it being claimed alike by New Hampshire and by New York, a condition of things adverse to the settlers' interests, which forced them to remain aloof from both and even to resist by force the writs and other law-processes, especially of the New York courts. During the period of the Revolution hostility to New York brought the organization of the Green Mountain Boys into existence, under Ethan Allen, to defend their own rights as well as to take part against the British in the war in the Canadian avenues of approach into Vermont. It was at Bennington that Stark (*q. v.*) of Vermont, assisted by troops from Massachusetts and New Hampshire won the battle on Aug. 16, 1777, that turned the tide against Burgoyne and made possible the great American victory at Saratoga, N. Y. The interstate disturbances and disaffections were finally removed, when New York in 1790 received $30,000 from Vermont in adjustment of the disputed land-claims, and waived its objection to the admission of the region as a state. In the following year Vermont formally entered the Union, the first state to be admitted under the constitution, having had no previous existence as a territory. During the Civil War the state patriotically did its duty in the extent of the local forces it put in the field. At their disbandment Canada for a time became the object of lawless raids by Fenians across the border from St. Albans. The present constitution dates from 1793, with repeated, subsequent amendments. The local legislature consists of 30 senators and of 246 representatives, the chief executive, besides the governor and the lieutenant-governor, consisting of a secretary of state, a treasurer and a superintendent of education. The judicial authority consists of a superior

court, of seven justices, who are appointed biennially. Vermont sends two members to the Federal House of Representatives. Consult Robinson's *Vermont* in the American Commonwealth Series and Gilman's *Bibliography of Vermont*.

Verna'tion, the arrangement of leaves in the bud, sometimes called *præfoliation*. Numerous names have been applied to various forms of vernation. Among the principal ones are imbricate, in which the edge of a leaf overlaps its neighbor; valvate, in which neighboring edges touch, but there is no overlapping; conduplicate, in which the leaves are folded lengthwise; convolute, in which the leaf is rolled from one margin; circinate (characteristic of ferns), in which the leaf is rolled from the apex downward.

Verne (*vârn*), **Jules,** a French writer, was born at Nantes, Feb. 8, 1814. He first wrote plays and opera pieces, and for some time was connected with a theater. His wild and improbable stories have most of them been translated into English. The first one to make him known, published in 1863, was *Five Weeks in a Balloon*. It was based on modern science and had an air of reality. His other writings, except an illustrated geography of France, are of the same character. His works include *A Journey to the Center of the Earth*, *Twenty Thousand Leagues under the Sea*, *From the Earth to the Moon* and *Around the World in Eighty Days*. He died at Amiens on March 24, 1905.

Vernet (*vâr'nā'*), **Claude Joseph,** an eminent French painter, was born at Avignon, Aug. 17, 1714. When on a voyage to Rome, in a terrible storm he was fastened to the mast, and the scene so impressed him that he became a painter of sea-views, being considered the first marine painter in Europe. His best-known work is a series of the seaports of France, executed by royal order. His works have been extensively engraved. He died in Paris, Dec. 3, 1789.

Vernet, Emile J. Horace, a French military painter, was born at Paris, June 30, 1789. His first military painting was the *Capture of a Redoubt*. His pictures of the life of Napoleon and the army, as *The Dog of the Regiment*, *Soldier of Waterloo*, *Barrier of Clichy*, were very popular, and engravings of them could be found in nearly every cottage in France. Louis Philippe sent him to represent the French government at Rome. He traveled extensively, wrote several works on art, and made hundreds of designs for illustrated books. His fame rests on his military pictures, as the battle-pictures of Jena, Wagram and Fontenoy and the *Capture of the Imala*. He died at Paris, Jan. 17, 1863.

Ver'non, Edward, an English admiral, was born at London, Nov. 12, 1684. He was at the taking of Gibraltar in 1704, and was made a rear-admiral when only 24. While a member of Parliament, he declared that Porto Bello could be taken with only six ships of war, and when put in command of six vessels and sent to the West Indies, he took the city in one day, with the loss of only seven men. The English people were wild over the victory; Vernon's birthday was celebrated in London with public illuminations; and 130 medals were struck in his honor. With a larger fleet he attacked Cartagena, but failed to take it. In the invasion of the Pretender, Vernon's fleet had command of the coasts of Kent and Sussex. On account of a quarrel with the officers of the admiralty, his name was struck from the list of English admirals. George Washington's older brother, Lawrence, was with Vernon on his expedition against Cartagena, and afterwards in his honor named the Washington home on the Potomac Mt. Vernon. Admiral Vernon died in Suffolk, Oct. 29, 1757.

Vero'na, a city of northern Italy, is situated at the foot of the Tyrolese Alps, on Adige River, 62 miles west of Venice. The fortifications, begun by the Romans and carried on by Charlemagne, were almost destroyed in 1801, but were rebuilt by the Austrians. The present fortifications are a circle of forts far outside the old city-walls. It is a city of palaces; the Scaligeri palace, built in 1370, and those of the Canossa and Pompeii families in the 16th century are among the finest. Among the many churches are the cathedral, consecrated by Urban I in 1187 and having Titian's *Assumption* on its walls; St. Anastasia, one of the finest Gothic churches in Italy; St. Zeno, rebuilt in the 12th century; and that of San Giorgio, with paintings by Paul Veronese. Among Roman antiquities is a ruined amphitheater, built of marble and seating 22,000 people, much like the Colosseum at Rome. There are some fine streets and squares, many art-collections, an academy of painting and sculpture, a theological seminary, a city library and beautiful bridges across the Adige. Its manufactures are of silk, linen and woolen goods, and it has a trade in sumac, grain and oil. The tomb of *Romeo and Juliet* has been destroyed, but another has been found to satisfy the curiosity of tourists. Verona was a Roman colony, its walls and gates having inscriptions dating from the 3d century. The ancient moat still remains as a canal around the old part of the city. It was taken by Constantine (312), Theodoric (489) and Charlemagne (774), and afterwards became a free city. For 100 years it was ruled by the Scala family. In the 15th century it was conquered by Venice. The French took the city in 1796, and ceded it to Austria in 1797. Since 1866 it has been a part of the kingdom of Italy. Population 74,271.

Veronese (*vā'rō-nā'zā*), **Paolo,** the name given to Paolo Cagliari, one of the great Italian painters, who was born at Verona in 1528 or 1532. His father was a sculptor and wanted to train the boy for the same profession, but his taste for painting was so decided that he was put under the teaching of an uncle, who was a painter. His first pictures were executed in the Church of St. Sebastian at Venice, and were scenes from the history of Esther, *Baptism of Christ, Martyrdom of St. Sebastian* and others. He was only 28 at the time, but this work placed him at once in the same rank as Tintoretto, then 45, and Titian, then in his 80th year. He obtained the commission for painting the ceiling of the library of St. Mark, and the work was so fine that even his rivals joined in voting him a golden chain as an honor. At Verona, his native city, he painted the *Banquet in the House of Simon the Pharisee.* His best-known work is the *Marriage at Cana,* now in the Louvre. It has about 120 figures or heads, many of them portraits, as Queen Eleanor of France, Francis I, Queen Mary of England, Tintoretto, Titian and Veronese himself. Other pictures are *Susanna and the Elders;* the *Supper at Emmaus; St. Helena's Vision of the Cross;* the *Annunciation; Esther Presenting Herself to Ahasuerus;* and *Venice, Queen of the Sea.* He died at Venice, April 19, 1588.

Veron'ica, St. or **Bereni'ce,** according to tradition, a woman of Jerusalem who, moved with pity at the sight of Jesus bending beneath the burden of His cross on His way to Golgotha, gave Him her kerchief that He might wipe the drops of agony from His brow. Jesus after using it handed it back to her, with the image of His face marked upon it. With this napkin, Veronica is said to have cured Tiberius, the Roman emperor, when very sick, and so convinced him of the divinity of Christ that he sent Pilate into exile. The napkin, it is claimed, is now at St. Peter's at Rome.

Versailles (*vĕr-sālz'*), a city in France, 11 miles southwest of Paris, where Louis XIII had a country villa and Louis XIV built the finest palace in France, costing so enormous a sum that he destroyed the accounts. The marble court, the chapel, the halls and galleries filled with historical pictures (the collection made by Louis Philippe having 5,000 works of art and costing $5,000,000), the battle-gallery hung with pictures of French victories, the Hall of Mercury, Hall of Apollo and galleries of war and peace are among the many departments of this grand palace. The gardens surrounding it with their beautiful fountains and statuary attract crowds of visitors from Paris. The orangery has 1,200 orange-trees, one said to be 465 years old. The grand canal, 200 feet wide and a mile long, in the time of Louis XIV was covered with gondolas and lighted up with fireworks. The park connects with the two palaces, the Grand Trianon, a one-storied building with wings, and the Little Trianon, a pavilion with an English garden around it, the favorite residence of Marie Antoinette. There are churches, a museum, a military hospital and military school in Versailles, but no buildings of interest except the palaces. The treaty of peace, by which England recognized the independence of the United States, was signed at Versailles in 1783. The states-general of France met here in 1789 and bound themselves never to separate until they had given France a constitution. Louis XVI was driven from Versailles to Paris and to prison. Louis Philippe restored the palaces at a cost of $5,000,000. During the Franco-German War it was the headquarters of the German army, and King William I was proclaimed emperor of Germany there in 1871. It was the seat of government while the Commune held Paris, and the French Parliament met there until 1871. Population 54,082.

Ver'tebrates, the highest subkingdom of animals. The difference between the backboned animals and the lower animals without backbones was recognized by Aristotle more than 2,000 years ago. It was not until 1797, however, that Lamarck founded the group of *vertebrata,* and defined it with distinctness. For a long time the line separating the vertebrates and the invertebrates was supposed to be a very sharp one. But a more thorough study of animal structure showed that the vertebrates have many affinities with the invertebrates, and doubtless were derived from them. When the group was first founded, the distinguishing mark of vertebrated animals was supposed to be the possession of a backbone composed of bony vertebræ. But this idea has become so much modified that it is no longer used in defining the group. Kowalevsky, a Russian naturalist, showed in 1866 that the tunicates develop in the same manner as the lowest vertebrates and, in their youth, closely approach the frog tadpole. This led to expanding the vertebrate group so as to include the tunicates, which were previously classed with the worms. Some other forms were later included for similar reasons. There are a number of forms, like the hagfish and lamprey, that have no bony spinal column, but nevertheless are true vertebrates. Therefore, the question arises: What are the marks of vertebrates, that distinguish them from all other animals and at the same time are possessed by all members of the group? There are three universally recognized features besides some others of smaller importance. The distinguishing features are (1) the possession of a nerve-cord located on the dorsal surface, that of invertebrates being on the ventral side of

the body; (2) a gristly rod or notochord, that runs lengthwise through the body just below the nerve cord. This notochord is the scaffolding about which the bodies of the vertebræ are formed when they are present and (3) the possession of gill-clefts. These structures are openings through the neck into the pharynx, and are present in fishes throughout life. They appear without exception in the embryonic stages of all higher animals as hereditary survivals, but soon become closed, and disappear before the period of birth. See DEVELOPMENT OF ANIMAL LIFE.

It is not possible to trace with certainty the path along which the vertebrated animals have been developed, but all possess some affinities (like jointed bodies and segmented kidneys) with the jointed worms, and the theory is widely accepted that vertebrates had remote ancestors that were very like the jointed worms. This is called the annelid theory, and was founded in 1875, chiefly by Dohrn and Semper. It is to be remembered, however, that there are other rival theories, and no one claims that any living animals represent the ancestors of vertebrates. These ancestors, whatever they were, have been long extinct.

The vertebrate subkingdom is divided into five classes: fishes, amphibia, reptiles, birds and mammals, all of which are further subdivided into orders, families and smaller groups. The principal facts of importance in reference to the different classes will be found by consulting those topics. See TUNICATES.

Vespa'sian, Titus Flavius Vespasianus, a Roman emperor, the tenth of the 12 Cæsars, was born in the Sabine country in 9 A. D. He held several Roman offices, as that of military tribune in Thrace, quæstor in Crete, ædile and prætor. At the head of a legion in Britain he conquered the Isle of Wight in 43. He was governor of Africa, the accounts of his reign there disagreeing; but whether a good or bad ruler, he was pelted with turnips by a mob. He was sent in 67 to war in Judæa, and conquered almost the whole country, except Jerusalem, in two years. The civil war between Otho and Vitellius gave him the opportunity to profit by his popularity, and he was proclaimed emperor at Alexandria in 69. The army of the east stood by him and, entering Italy, defeated and put to death Vitellius, sacked Cremona and took Rome after a terrible fight, in which the capitol was burned. Vespasian entered Rome in 70, where he restored the capitol, rebuilt the city, reorganized the army and by his own example shamed the luxury and extravagance of the period. The Jewish war, under the lead of his son Titus (*q. v.*), ended with the capture of Jerusalem, and the temple of Janus was closed, Rome enjoying peace for the nine years of Vespasian's reign. A new forum, the public baths, the temple of peace and the Colosseum were begun in Rome in the reign of Vespasian. He favored men-of-letters, Quintilian among others, to whom he gave a pension of $4,000 a year. He died on June 24 of 79. Consult Merivale's *History of the Romans under the Empire*. See JEWS.

Vespucci (*vĕs-pōōt'chē*), **Amerigo,** an Italian navigator, was born at Florence, Italy, March 9, 1451. He began life as a clerk in the commercial house of the Medici, and in their employ was sent to Spain, where, at Seville, he entered the service of a Florentine merchant who had fitted out the second expedition of Columbus, in 1493. Vespucci finished a contract his master had with the king of Spain to fit out 12 vessels for him. Vespucci, according to his own story, sailed first, perhaps as an astronomer, with an expedition from Cadiz on May 10, 1497. After touching at the Canary Islands, they reached "a coast which we thought might be that of a continent"—probably, from the description, Campeche Bay — and then sailed as far north as Cape Hatteras, returning to Spain in 1498. In a second voyage, in 1499, he reached the coast of Brazil, sailing north to the mouth of the Amazon and to Santo Domingo; and he made another expedition to Brazil, going as far as Georgia; and in 1503 he made his fourth voyage. Vespucci wrote a journal after his fourth voyage, but nothing of it remains except allusions to it. He also wrote several letters to a school-fellow in Florence, of one of which a Latin translation was printed in 1507. His claim that he reached the American continent in 1497, 18 days before the Cabots, has been disputed, and the general opinion is that he did not make that voyage, but there is no evidence that he had any thought of taking the honor of the discovery of the New World from Columbus. The name America was first applied to the New World by a geographer of Freiburg, named Waldseemüller, who, referring to Vespucci's letter says: "Now that a fourth part (of the world) has been found by Amerigo Vespucci, I do not see why we should be prevented from calling it Amerigo or America." Vespucci died at Seville, Feb. 22, 1512. Consult *Life and Voyages of Americus Vespucius* by Lester and *Narrative and Critical History of America* by Winsor.

Vest, George Graham, United States senator from Missouri, was born at Frankfort, Ky., Dec. 6, 1830, and graduated at Centre College, Kentucky, and at the law department of Transylvania University at Lexington, Ky. In 1853 he removed to Missouri, where he practiced law, and became a member of the legislature. During the Civil War secessionist leanings induced him to become a member of the Confederate Congress and later of the Confederate senate.

In 1897 he was elected Democratic member for Missouri in the United States senate, where he was prominent in many important debates. He was re-elected and served on committees on finance, commerce and the transportation of meat products. He died on Aug. 9, 1904.

Ves'ta, in Roman mythology, was the goddess of fire and the domestic hearth. The guardianship of the sacred fire in her temples was given to priestesses, called *Vestal Virgins*, at first four, but afterwards six. They were from six to ten years old when chosen, and spent 30 years in the service, the first ten in learning their duties; the second ten in acting as priestesses and guarding the sacred fire which must not be allowed to go out; and the last ten in teaching the new priestesses. If a vestal virgin violated her vow, she was stoned to death or buried alive. They lived in great splendor at the public expense, had the best seats in the theaters, and rode in state, preceded by a lictor. In Greece the priestesses of Vesta or Hestia were widows. On the first day of March, the Latin New Year's Day, the sacred fire of Vesta was renewed. The *Vestalia*, the chief festival in honor of Vesta, were celebrated on June 9, after which the temple was closed for five days for cleansing. In private houses the feast was kept by eating fish, bread and herbs before the hearth and the images of the *penates* or household gods. The worship of Vesta died out in the 4th century, after Christianity became the Roman religion.

Vesu'vius, Mt., the most celebrated volcano in the world, is on the Bay of Naples in Italy. It is about 4,000 feet high, and has two distinct peaks, called Somma and Vesuvius, though it had but one in ancient times. It is about 30 miles around the base of the mountain, and the ascent on the west side for three miles is a gradual slope to the cone, which rises nearly 2,000 feet higher. The top of the cone is cut off or truncated, and is 2,000 feet across, and the crater is 500 feet deep. About 40 kinds of minerals are found around the cone in the ancient lavas. Two electric railways carry visitors within a short distance of the mouth of the crater, and an observatory has been built about half way up the volcano, to study the eruptions and watch for indications of an approaching earthquake. The region around Vesuvius has been densely populated for more than 20 centuries, in spite of its numerous eruptions. The great eruption of Aug. 24 in A. D. 79, which destroyed Herculaneum and Pompeii, is the first one of importance. It was not lava but showers of ashes, condensed into mud by the rain produced by the steam of the volcano, that seems to have overwhelmed the cities below it. In an eruption in 472 the ashes were carried to Constantinople, and in 1066 the lava flowed to the sea. The next great eruption was in 1631, when 18,000 lives were lost. A stream of lava 1,204 feet wide and 15 feet high destroyed the town of Torre del Greco in 1794. The eruptions increased in frequency in the last century, and the volcano is never entirely quiet. Consult *Volcanoes* by Scrope and *The Geology of Monte Somma and Vesuvius* by Johnstone-Levis. See HERCULANEUM, PLINY and POMPEII.

Ve'to, a word introduced from the Latin, meaning I forbid. It is used to indicate the power possessed by the people or their rulers to object to an act of the legislature and in some degree to prevent its being carried out. The Roman tribunes had the power of stopping the decrees of the senate by using the word *interdico* (I interdict); and so it is customary to say that the use of the veto began with them. In Poland it was settled by law in 1652 that in the imperial diet any deputy could hinder the passage of a measure by saying *Nie dozwalam* (I do not allow). In the national assembly of France, at the revolution, the king had a conditional veto, but Napoleon restored an absolute veto to the ruling power. The sovereign of England has the power to veto a bill of Parliament, but the right has not been used since 1707. The veto in the United States is the power of the president to refuse his signature to a bill passed by both houses of Congress; but Congress can pass a bill over the president's veto by a majority vote of two thirds in each house. President Jackson's veto of the bill to recharter the Bank of the United States is one of the earliest instances of the use of this power by the president. See CONGRESS, PRESIDENT and UNITED STATES.

Vevey', a town of Switzerland, ten miles southeast of Lausanne, on Lake Geneva. Its situation on the lake with a range of mountains opposite, and the fine scenery near it make it very attractive to tourists. It is built in a triangle, with a fine market-place and two or three churches. Population 11,916.

Vi'a-Ma'la, a gorge in the canton of Grisons, in Switzerland, 1,600 feet deep, through which rushes the Hither Rhine, looking like a thread. It is about two miles long, and the great walls of rocks are so hard that apparently they have not been changed by the effects of the weather since they were thrust apart, and they are so near together in some places that a trunk of a tree or a stone may be wedged in between them. It was once considered inaccessible and called the Lost Gulf, but a road has been built by blasting from 400 to 600 feet above the river, crossing from side to side by bridges, and protected by overhanging rocks or a wooden roof from falling trees and stones.

Vibur'num, a class of shrubs and small trees belonging to the honeysuckle family. Of the nearly 80 species about a dozen are found in the United States, growing in woods or hedges. The hobble bush, whose straggling branches catch the traveler's foot, is found in the northern states; the sheepberry or sweet virburnum, having clusters of fragrant flowers in May or June and a blue-black, eatable fruit, and growing sometimes from 20 to 30 feet high; the arrow-wood, with sharp teeth on its large-veined leaves; and the maple-leaved virburnum, easily mistaken for a small maple tree and called dockmackie in some parts of the country, are the most common varieties. The lamestinus, a native of southern Europe, with evergreen leaves and white flowers, belongs to the viburnums and is a favorite house-plant.

Vi'car of Wakefield, The, an idylic novel written by Oliver Goldsmith (1766). Goethe called it one of the best novels ever written. The chief character is Dr. Primrose, a worthy but simple-minded country clergyman whose poverty and unworldliness lay him open to petty swindles and misfortunes, which are ultimately righted. Throughout the story the reader is kept in a pure and healthy atmosphere. Though the novel can scarcely be said to have a plot, it gained immediate popularity because it so perfectly expressed the homely English sentiment. Its feeling for nature showed the approach of the romantic movement. It was translated into several continental languages. Its excellence is found in its simplicity, naturalness, truth, sweetness, purity of atmosphere, kindly humor and charming delineation of character, while the moral struggle depicted lacks in strenuousness.

Vichy (*vē'shē'*), a town of France on Allier River, celebrated for its mineral waters. There are 21 springs in or near the city, the water of those outside the town being carried in by aqueducts. All the springs, whether hot or cold, are strongly impregnated with soda. The water is clear, with an alkaline taste. The bath-houses can furnish 3,500 baths a day. There is a large trade in the natural waters, and in the manufacture of salts for artificial baths. The visitors often number 15,000 yearly. Population 14,100.

Vicks'burg, Miss., county-seat of Warren County, on the Mississippi, about half way between Memphis and New Orleans. The city is built on terraces rising from the river, with streets narrow but well laid out. It has 20 miles of beautiful driveways, a magnificent military park of 1,400 acres and a national cemetery wherein repose 16,600 soldiers. Situated in the finest cotton-region of the country, it has a large trade in cotton and manufactories of cottonseed-oil and cake, cotton compresses, a dry dock, rolling-mills, foundries, machine shops and factories, which produce baskets, veneering and furniture. Vicksburg was fortified and guns were placed to command the river in the Civil War as early as January, 1861. It was unsuccessfully attacked by Farragut and also by Sherman in 1862, but on July 4, 1863, it surrendered to Grant. Population 15,710.

Vic'tor Emman'uel II, king of Italy, born at Turin, March 14, 1820, was the son of Charles Albert, king of Sardinia. After serving gallantly in the army, he became king of Sardinia by the abdication of his father on the evening of the battle of Novara, March 23, 1849. From the Austrian conquerors of his country he succeeded in obtaining the withdrawal of their demand that the Sardinian constitution be abolished. This liberal constitution, granted by his father, he faithfully maintained, earning by this conduct the title of The Honest King and winning the confidence of the Italian nation. He chose wise counselors, and, with Cavour to guide, made many reforms, took part in the Crimean War, and visited Paris and London. With the help of the French the battles of Solferino and Magenta were fought against Austria, but the peace of Villafranca between Austria and France left Italy still distant from its hoped-for unity. But Tuscany, Modena, Parma and the Romagna voted for annexation to Sardinia, and the Prussian alliance in 1866 gave Venice to Italy. The French withdrew from Rome, and on Dec. 31, 1870, Victor Emmanuel entered Rome and became king of a united Italy. He reigned eight years, dying at Rome, Jan. 9, 1878. Consult *Life* by Dicey and by Godkin and *Italy under Victor Emmanuel* by Arrivabene.

Victor Emmanuel III of Italy, born Nov. 11, 1869, the only son of Humbert I, whom he succeeded on the throne on the assassination of his father, July 29, 1900. His mother is Queen Margherita, daughter of the late Prince Ferdinando, Duke of Genoa. In 1896 he married Helena (born 1873), daughter of Nicholas, Prince of Montenegro, the heir-apparent being Humbert, Prince of Piedmont (born 1904). Victor Emmanuel III has always been greatly interested in military matters, and from choice has seen a good deal of the German army. Before coming to the throne, he held the post of commanding-general at Naples.

Victo'ria is a state in the southeast of the Commonwealth of Australia. In 1906 the population had become 1,237,998. Murray River forms its northern boundary, dividing it from New South Wales, and the ocean its southern one. On the west is South Australia. Victoria is 480 miles long and about 250 wide, and covers 87,884 square miles. The coast is about 800 miles long, with Portland Bay, Port Phillip Bay and

Corner Inlet as harbors. A chain of mountains, called Dividing Range, running nearly east and west, divides it unequally. The eastern part of the range, called the Australian Alps, is from 1,000 to 7,000 feet high, Mts. Hotham, Smith and Selwyn being high peaks. Along these ranges grow gigantic trees. The western part of the range is called the Grampians, where the principal peak is Mt. William. The western part of Victoria is level, with fine pastures for the merino, whose wool brings the highest price in the markets of Europe. Part is covered with timber and reserved as a state forest. Many thousand square miles in the east are unexplored, and more than ten millions of acres are so covered with forest-clad mountains as to be too wild for settlement. The streams are too small for navigation, except the Murray and the Yarra. The climate is fine, about half the year being bright, with a bracing, dry, pleasantly warm atmosphere. The temperature never falls below freezing, except for an hour or two before sunrise, in the coldest month. Snow has fallen only twice at Melbourne, though common on the higher plains and mountains. The disagreeable feature of the climate is the north wind, cold and dry in winter, hot and dry in summer. The trees, among the largest in the world, mostly are *eucalypti* or gum-trees. The white gums are the most beautiful, standing in groves, their long, branchless trunks, as smooth as marble, looking like the pillars of a cathedral. The largest measured was 470 feet long and 81 feet around. Eucalyptus oil comes from the blue gum, and the red gum is used for timber, being almost indestructible. Magnificent ferns and fern-trees are found in the forests. The kangaroo, opossum, wallaby, vandicoot and wombat are among the peculiar animals, all belonging to the marsupials (*q. v.*), and the parrot, cockatoo and laughing jackass or kingfisher are among the native birds. Snakes are numerous, but not venomous. Wheat, barley and oats are the principal crops, and almost all fruits except oranges and bananas are grown. See AUSTRALIA: *Victoria*.

Victoria, Can., capital and seaport of British Columbia and second seaport of Canada. It is on a narrow inlet opening from the Strait of Juan de Fuca into the southeastern coast of Vancouver Island. It is the headquarters of the Canadian fur-sealing fleet. Three miles northwest is Esquimault, connected with it by an electric road. The parliament buildings, beautifully located, and the new hotel of the Canadian Pacific are imposing buildings. Population 25,000.

Victoria, queen of Great Britain and Ireland and empress of India, was born at Kensington Palace, May 24, 1819. She was the daughter of Edward, duke of Kent, and granddaughter of George III. At the death of her uncle, William IV, she became queen on June 21, 1837. On Feb. 10, 1840, she married her cousin, Prince Albert of Saxe-Coburg-Gotha. When she came to the throne, she found Lord Melbourne, under whom her education had been conducted, at the head of her government, where he remained until 1841. His successors have been such men as Peel, Russell, Derby, Palmerston, Disraeli, Gladstone and Salisbury. Under her wise leaders the queen saw the country carried safely through the revolutionary period of 1848, the fall of the French monarchy, the formation of the kingdom of Italy and the German Empire and the Civil War of the United States. Some of the important measures of the period were the adoption of penny postage, abolition of the corn-laws, the transfer of the East India Company's possession to the crown, the Irish land-act and the admission of Jews to the house of commons. The most disturbing question of the period, which is still unsettled, was the relation of Ireland to Great Britain. The Crimean War, the Indian Mutiny, the Abyssinian War and wars in Egypt, Afghanistan and South Africa were the principal military events of her reign. In 1861 her husband, known as the Prince Consort, died, and the queen lived in partial retirement until 1876, when she again opened Parliament in person. In 1877 she was proclaimed empress of India. The reign of Queen Victoria was the longest and one of the most prosperous in English history. She understood the relation between the crown and the people, did not oppose reforms, and left the government largely in the hands of her ministers, which justified her being considered the most constitutional monarch of Britain. Her home life also was an example to her subjects, and earned the respect of the civilized world. It was altogether fitting that Tennyson should dedicate poems of his to this worthy woman. She was the stalwart friend of the American Union in 1861–5, and her womanly sympathy with the widows of Pres. Lincoln (1865) and Pres. Garfield (1881) endeared her to all Americans. The Boer War of 1899 grieved her deeply. She had nine children, the oldest daughter being the late Empress Frederick of Prussia, and the oldest son, Albert Edward, now reigning as Edward VII. The queen's jubilee was celebrated in

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1887 and the diamond jubilee in 1897. She died on Jan. 22, 1901. Consult *Life of the Prince Consort* by Martin; *Leaves from the Journal of Our Life in the Highlands* by Queen Victoria; *Life* by Greenwood; *History of Our Own Times* by McCarthy; and *Journal of Victoria's Reign* by Greville. See ENGLAND, IRELAND, GREAT BRITAIN and SCOTLAND.

Victoria Nyanza (*nī-ăn'zä*), one of the great fresh-water lakes of Africa, is crossed by the equator, and is about 3,308 feet above the sea. *Nyanza* merely means a large body of water. The lake was discovered by Speke, the African traveler, in 1858, and he explored the western and northern shores in 1862. The lake flows into a beautiful river, with cataracts, called Ripon Falls, Karuma Falls and Murchison Falls, the last, a descent of 120 feet, entering Lake Albert (*q. v.*) after a journey of 100 miles. This river is now called the White Nile, but Lake Victoria is not considered the source of the Nile.

Victoria University, Can., was formerly at Cobourg, Ontario, representing the Methodist body, but has federated with the University of Toronto. The governing body is represented on the senate of the University of Toronto, its graduates elect representatives to the same body, and by the removal of the faculty and students to Toronto, where college buildings have been erected in the northern part of Queen's Park, a union of the universities was effected. The theological colleges also formerly in affiliation with the University of Toronto have become federating colleges, and enjoy increased representation on the senate. Dr. Burwash is president of both faculties, — arts and theology. Victoria has for many years been one of the most useful educational institutions in Canada. Her graduates by the hundreds are to be found all over Canada, honorably filling important positions. Victoria has trained some of the ablest and most influential ministers of the Methodist church of Canada. The average yearly attendance of students in theology is 150.

Vien'na, the capital of the Austrian Empire, is on the Danube River. An arm of the river, called the Danube Canal, passes through the city, and a little stream, the Wien, flows into it and gives its name to the city. Vienna is in a plain, bordered by hills, belonging to the Styrian Alps. There are two parts — the old town, and the suburbs. The streets of the old town, run to a point in the center, like the spokes of a wheel. Between the old town and the suburbs is an open space, from 600 to 1,500 feet wide, turfed, shaded with trees and laid out in walks, which occupies the place of the old wall and fortifications. The suburbs, 36 in number, completely surround the old town and are encircled by a wall 12 feet high, with 13 gates, called the "lines" of Vienna. Another wide boulevard goes around the city, which is 16 miles in circumference. The old town is the most fashionable part of the city, and contains the palaces of the emperor and nobility. The people live in flats, none but the richest nobles occupying a whole house. The apartment houses, called *zinspaläste* (tenement palaces), are many of them finely adorned with statues and other ornaments, and are quite a feature of Vienna. Other modern buildings are the museums of art and natural history, the palace of justice, the houses of parliament, the new court-theater, and the new opera-house, one of the finest in Europe. The most important of the old buildings is the Cathedral of St. Stephen, one of the finest specimens of Gothic architecture in Europe, with a tower 450 feet high, the catacombs where the emperors are buried and the tombs of Frederick III and Prince Eugene of Savoy. The imperial palace dates from the 13th century, though additions have been made to it at various times. It has a library of 400,000 volumes and fine collections of antiquities and curiosities. The University of Vienna, established in 1365, has 512 teachers and 8,108 students. There also are two theological seminaries, a conservatory of music, a military school, an academy of science and an academy of art. The academy of art, the Belvedere palace and some of the private galleries of the nobles have very fine collections of paintings, antiquities, and armor. The Prater is a great park of 2,000 acres on the east of the city, where the great exhibition of 1873 was held. Vienna has a large grain-trade, and also exports wine, cattle and manufactured goods, such as carriages, iron ware, and cotton and silk goods, rivaling Paris in its leather and fancy goods and being noted all over the world for its meerschaum pipes and bent-wood furniture.

Probably Vienna originally was a Celtic settlement. It was taken by the Romans, called Vindobona, and made a military post. In 180 Marcus Aurelius died there. Attila and his Huns occupied it for a time in the 5th century; the crusades made it prosperous by the large trade they brought to it; and in 1276 it became the capital of the Hapsburgs. It was besieged by the Hungarians in 1477, taken by Matthew Corvinus in 1485, defended bravely against the Turks in 1529, and again in 1683. It was the meeting-place of the congress of Vienna in 1814, where the affairs of Europe were settled after the downfall of Napoleon. Population, 1,999,912.

Vil'lafran'ca, a town of Italy, nine miles south of Verona. Its chief industry is the silk-trade. It is known as the scene of several battles, including the defeat of Charles Albert, king of Sardinia, by Ra-

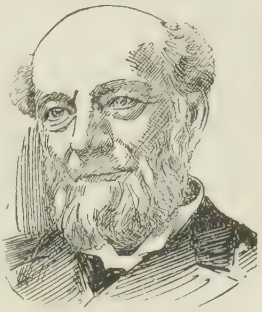
detzky, the Austrian general, July 25, 1848. and of the Italians by the Austrians, June 24, 1866. It is also noted as the place where (July 11, 1859) the emperors Napoleon III and Francis Joseph signed the treaty which gave Lombardy to Victor Emmanuel, called the Peace of Villafranca. Population 9,729.

Villars (*vē'lär'*), **Claude Louis Hector,** Duke of, a French general, was born at Moulins, France, May 8, 1653. His first service was in Holland and Germany. During the time of peace he was sent as an ambassador to Vienna and Munich. In the War of the Spanish Succession he captured Kehl, defended the northeastern frontier of France against Marlborough, and took several towns in Alsace. He was defeated at Ramillies and wounded at Malplaquet. His brilliant campagn in 1712, in which he defeated the Austrians at Denain, compelled Prince Eugene to raise the siege of Landrecies, and took several towns; and brought about the Peace of Utrecht (1713) and the Peace of Rastadt (1714). When more than 80 years old, in 1733, when the war with Austria began, he was given command in Italy, but soon asked for his recall, and died on his way home, at Turin, June 17, 1734. He was made marshal-general of France by Louis XV, a rank before conferred only on Turenne.

Vill'iers. See BUCKINGHAM.

Vincennes (*vĭn-sĕnz'*), **Ind.,** an old, settled, historic city, the capital of Knox County, on the Wabash River, in southwestern Indiana, 50 miles north of Evansville and about 105 miles southwest of Indianapolis. It is served by four railroads, and has a number of fine parks and public buildings. From 1800 to 1813 it was the capital of Indiana, and originally had been a fort, erected in 1702 by the French. After its capture by the English in 1763 and their actual possession in 1777, this fort became a "bone of contention." The valiant Geo. Rogers Clark (*q. v.*) of Kentucky and his Virginians, assisted by the Ohio Valley French, secured this prize, and by this means brought the great middle west to the United States. Here is the seat of Vincennes University, with 300 students, and of a Roman Catholic academy, a public library and other educational institutions. Vincennes University was founded in 1806, and the first school in Indiana was founded in Vincennes by Father Rivet, and the first church built in the Northwest Territory was erected here in 1742 by Father Meurin. Vincennes has a number of industries, including flour and woolen mills, packing houses, breweries, brick and tile works, carriage and furniture factories, agricultural implements and machine-shop products. Population 11,393.

Vin'cent, John Heyl, bishop of the Methodist Episcopal church and chancellor of the Chautaqua system, was born at Tuscaloosa, Ala., Feb. 23, 1832, and educated at Lewisburg and Milton, Pa., and in the Newark (N. J.) Wesleyan Institute. After this he removed to Illinois, and there held charge at Joliet, Galena, Rockford, Mount Morris and subsequently at Chicago. Here he founded the *Sunday-School Quarterly* and the *Sunday-School Teacher*, containing the lessons that have become international.



BISHOP VINCENT

With Lewis Miller of Akron, O., he established the Chautauqua Assembly in 1874, and four years later founded also the Chautauqua Literary and Scientific Circle, of which he has since been chancellor. He has been preacher at Yale, Harvard, Cornell, Wellesley and other colleges, and is the author of *The Chautauqua Movement*, *The Church at Home*, *Our Own Church*, *The Modern Sunday-School*, *The Church School and Sunday-School Institutes* and *Earthly Footsteps of the Man of Galilee.*

Vinci (*vĭn'chē*), **Leonardo da,** an Italian painter, was born at the Vinci palace near Florence, Italy, in 1452. He was celebrated as painter, architect, sculptor, musician, scientist, engineer and mechanic, anticipating many of the great discoveries of astronomy and geology. He founded an academy of art; executed a model for an equestrian statue of Francesco Sforza; traveled through Tuscany as an engineer and architect; and designed the canal of Martesana at Milan. His celebrated picture, *The Last Supper*, was a fresco in a convent at Milan, now in a damaged condition. The best copy, by one of his pupils, is in the Royal Academy, London, and the most celebrated engraving of it is by Morghen. His *Adoration of the Kings* was painted at Florence, as were several portraits, now in the Louvre at Paris. He went with Francis I as court-painter from Milan to France, where he died near Ambroise on May 2, 1519. Consult *Life* by Clement and *Legends of the Madonna* by Mrs. Jameson. See FINE ARTS (*Italian*).

LEONARDO DA VINCI

Vine. See GRAPE.

Vin'egar is a weak form of acetic acid, generally produced by fermentation of the juices of fruit, which have already undergone alcoholic fermentation, and varying in flavor according to the material from which it is made. In Great Britain vinegar is usually made from malt, which is fermented in casks, which are three quarters full, with holes for the entrance of air. They are kept at a certain temperature (about 70°) and the process may take weeks or months. The vinegar is then filtered and cleared. What is known as the German rapid process consists in pouring the malt or fermented wort in a shower on to shavings in a cask, and drawing off the liquid and pouring it in again, repeating the process until the vinegar has the right degree of acidity. Wine vinegar is largely made in France and other wine-producing countries from the poorer wines and the lees or settlings of the wine vats. It is white or red, according to the color of the wines used. In the United States cider vinegar is considered the best, and the process essentially is the same as that used in making malt vinegar, warmth and exposure to the air being the two necessary conditions. Home-made vinegar is often produced by putting what is known as the vinegar plant or mother into a weak solution of sugar or molasses. The vinegar plant is found in old vinegar barrels, and is a fungus growth similar to the yeast-plant. The word vinegar means sour wine. See FERMENTATION.

Vi'olets, a class of well-known plants, found mainly in temperate regions. There are over 200 species, which are sometimes divided into stemless and leafy-stemmed violets. The common violet, found wild in the United States in pastures and woods, has heart-shaped leaves and flowers usually light or dark violet, though there are white and yellow varieties. The round-leaved violet, found in the northern woods with yellow flowers, the sweet white violet, the larkspur violet, arrow-leaved violet, Canada violet etc. are among the many varieties. The English violet is prized for its fragrance, and is cultivated extensively for winter bouquets. The most showy and popular variety of the violet is the pansy or tricolor, which has been introduced from Europe. Its irregular-shaped flowers, with their beautiful coloring, in white and shades of purple and yellow, are among our commonest garden flowers. They are said to have been first raised about 1810 by Lady Mary Bennett from a common weed. They are called pansies from the French word *pensées* (thoughts), heartsease, none-so-pretty, love-in-idleness, Johnny-jump-up and kiss me at the garden gate.

Vi'olin', a stringed instrument, which is played with a bow. It is a hollow wooden box, made from pine and maple or sometimes deal and sycamore wood, with a solid handle, and is strung with four strings. The bow is strung with horsehair, and when drawn across the strings sets them in motion. The different notes of the musical scale are produced by stopping the strings with the fingers on a fingerboard on the handle. The quality of a violin depends upon the fineness and thinness of the wood, the curvings and arches, the strings, the varnish, the shape of the sound-holes or openings etc. The best violins were made at Brescia, Cremona, Mantua, Milan and Venice, where, on the southern slopes of the Alps, could be found the fine elastic pine best adapted to the purpose. Salo, Maggini, the Amati family, Joseph Guarnerius, called Gesu, and Stradivarius are among the most celebrated violin makers of Italy; Norman was the first English maker of violins; and Jacobs and Kloz are well-known among German artisans. The greatest of all violin-makers is Stradivarius, born in Cremona in 1644. He learned his trade of the Amati family, but made such improvements that all violins since, whether good or bad, are copies of his work. A fine violin of his manufacture will bring from $1,500 to $3,000. The Cremona varnish, very fine, brilliant, clear, and red or brown in color but in its most beautiful form resembling amber, was used by these Italian artists, but the secret of its manufacture or the mode of applying it seems lost. The viol was the original of the violin. It was a stringed instrument with from five to 15 strings, and the fingerboard was divided by frets — strips of metals — as in the guitar. The viola and violoncello are varieties of the violin, called also tenor and bass viols. The violin is also called fiddle, from the Anglo-Saxon *fythel.* Violins are now made mostly in France and in Saxony. See STRADIVARI.

Vi'per, the common name for several very poisonous snakes of the Old World. They have a triangular head and a robust body. The European viper, often called the asp, is widely distributed in Europe. It is about two feet long, of yellowish brown color, with black spots. In England, a similar form, commonly called the adder, is the only venomous reptile known to inhabit Great Britain. In Africa the most common variety is the horned viper with a horn-like scale over each eye. It lies partly hidden in the sandy wastes of northern Africa, awaiting its prey. It is possible that this is the asp used by Cleopatra in committing suicide. There are two vipers in India, one about 20 inches long and the other about four feet long.

Vir'chow (*fêr'kō*), **Rudolph,** a German physician and pathologist, was born in Pomerania, Oct. 13, 1821. He studied medicine at Berlin, and lectured on anatomy in the university there. In 1848 he became a leader of the Liberal party and was elected to the Prussian house of deputies, losing

his position in the university because of his liberal ideas. He was appointed professor of anatomy at Würzburg in 1849, and in 1856 he was called back to Berlin, put in charge of a medical institute, and given the chair of pathological anatomy in the university. The Prussian government sent him in 1848 to Silesia, to study the typhoid fever that was prevailing there; and the Bavarian government, in 1852, asked his aid in ascertaining the causes of a famine fever; while the king of Sweden begged him to investigate the leprosy that was prevalent in the western part of Norway. He was a member of the German Congress and for a long time an alderman of Berlin. He distinguished himself in a number of different fields of learning. He is recognized as the originator of cellular pathology, and, on account of the general bearing of his studies, as one of the founders of modern biology. After 1856 he was director of the Pathological Institute, Berlin. He published a large number of scientific papers, a handbook of *Special Pathology*, one on *Cellular Pathology* etc. On his seventieth birthday, Oct. 13, 1891, he was given a public reception, attended by thousands of his friends and former pupils. He died on Sept. 5, 1902.

Vir'eo or **Green'let,** a class of birds somewhat like the shrikes. They are found in America, migrating usually in May from South America to the United States. They are very destructive to insects, but are sweet singers. The color usually is a shade of green, with white markings. They build their nests in trees and bushes, hanging them from twigs and making use of pieces of hornet-nests, flax and paper, which they glue together with the silk from the caterpillar or the saliva of birds. The nests are so strong that other birds and even mice will use them after they are deserted by their owners. The red-eyed vireo, the white-eyed vireo, the solitary vireo and the Whip-Tom-Kelly are varieties found in the United States.

Virgin'ia is one of the thirteen original states of the Union. It is a rough triangle in shape, with its broad base resting on North Carolina and Tennessee, running along Kentucky and West Virginia on its western side, and having Maryland and the Atlantic Ocean on the eastern side. Its longest line from east to west is 476 miles and from north to south 192 miles; the whole area being 40,125 square miles.

Surface. It has a hilly region and a region of lowlands, as the southeastern part is a broad, undulating plain, nowhere rising more than 800 feet, while the northwestern part has parallel mountain ranges, reaching 5,700 feet in their highest points, with valleys between. The region next the Atlantic on Chesapeake Bay, called Tidewater Virginia, is divided into five great peninsulas, with hundreds of smaller ones, giving a coast of nearly 2,000 miles. This region, going inland 100 miles, only rises from 12 to 100 feet above the sea. Midland Virginia and Piedmont are two of the six steps by which Virginia rises gradually from the seashore to the Appalachian Mountains and reaches to the fourth rise, the Blue Ridge country, which is diversified by the two portions of the range and the fine tablelands, at heights varying from 916 to 5,700 feet. The valley of Virginia, the next step, 300 miles long, is a part of the great Appalachian valley stretching from Canada to Alabama, and lies between the Blue Ridge and the Kittatinny or North Mountains. With its broad valleys, its mountain chains and rivers it forms one of the finest regions in the United States. The Appalachian region has high mountains and deep, trough-like valleys, and forms the grazing and timber region of the state, while beyond lies the Virginian portion of the tableland stretching westward from the Alleghanies, which is the coal-region. The highest peak in Virginia is Mt. Balsam (5,700 feet) on the border of North Carolina.

Drainage. The Potomac, Rappahannock, York and James, with their tributaries, flow into the Atlantic through Chesapeake Bay. The Great Kanawha flows into the Ohio, and other small rivers into the Tennessee. The climate is as varied as the country and its resources. The state is noted for its clear skies, pure air and freedom from great storms.

Natural Resources. Virginia has great forests of balsam, pine and other trees, which are being rapidly exhausted. It also has valuable fisheries, especially of oysters, and the mineral wealth is considerable, but as yet not extensively developed. The output, however, is valuable. Among the varieties worked are marble, granite, sandstone, limestone, slate, coal, iron, talc, soapstone, titanium, gold, silver, lead, zinc and copper. There are some gold-mines in the belt which extends from Washington to Halifax Court House, 200 miles long and from 15 to 25 wide, and the manganese mines are the largest in the world. Salt is obtained from artesian wells, which reach a solid bed of salt. There are many mineral springs, some of which, notably the White Sulphur, have long been popular as summer resorts. The Natural Bridge, with a span of 80 feet, 215 feet high and 100 feet wide, is one of the remarkable natural arches of the world. The caverns of Luray, Weyer's cave and Madison cave, the Crabtree falls, descending 2,000 feet, and the Dismal swamp, covering 150,000 acres, are among the scenic features.

Manufactures. The manufactures include extensive iron and steel works, flour-milling, lumber and its products, paper and pulp, glass, trunks, leather-goods, railroad-cars, foundry and machine-shop

products, chewing and smoking tobacco (*q. v.*) and snuff, cigars and cigarettes, stemmed tobacco, fertilizers and cotton-goods.

Agriculture. The cultivation of early vegetables and small fruits for northern markets is among the profitable employments. Corn and tobacco are grown in all portions of the state, and wheat, oats, hay, buckwheat, rye and barley are also produced in large quantities. Peanuts are the leading crop in the low, coastal region, orchards and vineyards in the middle regions, and in the higher portions are the pasture-lands and cattle-farms. The live-stock industry brings more money to the farmers than does tobacco, and the dairy-products but little less. The value of the poultry and eggs almost equals that of the dairy-products. Only a small portion of the state is devoted to cotton-raising. Sumac-leaves and oil of sassafras are peculiarly Virginian products.

Education. The school-system dates from 1870, and costs $2,137,361 annually. In 1906 there were 1,873 schools, the elementary ones having 8,814 teachers and 356,192 pupils and the high schools having 258 teachers and 5,580 students, besides seven colleges. There are three public normals and two private normals. The College of William and Mary, now used as a state normal school, for more than a century was one of the principal southern colleges and stands next to Harvard in age, being the second college founded in the United States. The University of Virginia (*q. v.*), near Charlottesville, owes its existence mainly to Jefferson. The old buildings were designed by him. It has a museum of natural history, a Gothic chapel, an experimental farm and an observatory with one of the largest telescopes in the world. Washington and Lee University, first named Washington College in honor of Washington, who endowed it with property given him by the state, after being presided over for five years by Robert E. Lee received its present name from the legislature. Hampden-Sidney College, Emory and Henry College, Randolph-Macon College (for men, at Ashland; for women, at Lynchburg); Roanoke College, Virginia Military Institute, Virginia Agricultural College, with the United States experiment station, and St. John's Theological Seminary are other institutions of higher learning. There are theological seminaries for white students at Richmond and Alexandria and for colored students at Richmond, Lynchburg and Petersburg. The University of Virginia has a medical department, and there are two other medical colleges. For the higher education of the negro there are Hampton Normal and Agricultural Institute at Hampton (*q. v.*), Hartshorn Memorial College (female), Virginia Union University at Richmond and Virginia Normal and Industrial Institute at Petersburg. This is supported by the state. Separate schools are maintained for the white and the colored race, and no child under 12 can be employed in any mining or manufacturing work.

Institutions. There are national cemeteries at Arlington, Ball's Bluff, Culpeper, Fredericksburg and Richmond; a navy-yard and naval hospital at Gosport; an artillery school at Fortress Monroe; and a home for disabled volunteers at Hampton. There are charitable institutions for the aged and orphans at Richmond, a state school for the deaf, dumb and blind at Staunton, insane asylums (for whites) at Williamsburg, Marion and Staunton, with one for colored at Petersburg. There are a soldiers' home at Richmond, an industrial school for boys at Laurel and a state penitentiary at Richmond.

History. The whole country from Cape Fear to Halifax, Nova Scotia, was first named Virginia, in honor of Queen Elizabeth (the Virgin queen), after its discovery by Raleigh. The first permanent English settlement in America was made at Jamestown on May 13, 1607. The London Company, under whom the colonists had been sent out, by charter from James I held the land for 400 miles along the coast and 400 miles back into the interior and all islands within 100 miles of the coast. In 1619 negro slavery was brought into the United States by the sale of 20 slaves brought to Jamestown in a Dutch man-of-war. In 1754 Virginia established a fort at Pittsburgh on the Ohio, which was taken by the French, and the French and Indian War followed, ending in the treaty of 1763, which left the Mississippi as Virginia's western boundary. In 1784 the state ceded all the land beyond the Ohio to the United States on condition that slavery be prohibited in the new states formed out of the territory. In the War of Independence and in that of 1812 Virginia was prominent, giving the head to the Revolutionary army and also the first president to the new republic in the person of Washington, whose home, Mt. Vernon, on the Potomac, has been presented to the nation. In the Civil War Virginia at first refused to secede, but later joined the southern confederacy, losing thereby the western part of the state, which refused to secede. The state suffered more than any other in the Union, being the most important battleground of the country, on which were fought some of the most destructive contests of the war, which ended on the soil of Virginia at Appomatox Court House, as had that of the Revolution by the surrender of Cornwallis at Yorktown. The chief cities of Virginia are the capital, Richmond (population 87,246) and Norfolk (66,931). Population of the state

1,973,104. Consult *History of Virginia* by Magill; *History of Virginia* by Burke; and *Early Settlement of Virginia* by Neill.

Virginia City, Mon., county-seat of Madison County, on the eastern slope of the Rocky Mountains, 110 miles south of Helena. It was the capital of the territory for ten years. It was settled in 1863, when gold was found in the Alder gulch, one of the famous mining-regions in the world. This district has since yielded $50,000,000 worth of gold. Population 800.

Virginia City, Nev., county-seat of Storey County, about 180 miles northeast of San Francisco. It is on the steep slope of Mt. Davidson, about 6,300 feet above the sea. It is built over the great Comstock lode (*q. v.*), the largest mineral vein in the world. The city was founded in 1859, and grew rapidly with the influx of gold-seekers, until in 1875 it had 15,000 inhabitants. Since the decline in the price of silver the town has steadily decreased in size, and the present population is only 2,695. The Comstock lode was discovered by a Virginian and this fact has given the name to the city. The town has a library, churches, schools and newspapers, and has electric and gas plants and, for domestic and mining purposes, a daily supply of 10,000,000 gallons of water.

Virginia Creep'er, a vine belonging to the grape family. It is found in North America, and known by its glossy five-parted leaves, which become a bright scarlet in the fall, and its dark-blue berries. It grows 50 feet or more, clinging by tendrils to old walls and trunks of trees. It is also called American woodbine and American ivy, and is sometimes mistaken for the poison-ivy. It can be distinguished easily by its five-parted leaves from the poison-ivy, which has three-parted ones. A Japanese variety of the American creeper has been introduced, with variegated leaves, which is very popular, and hardy as far north as Boston.

Virginia, Minn., a city, in St. Louis County, on the Great Northern, Duluth and Iron Range, the Duluth, Rainy Lake and Winnipeg and the Duluth, Missate and Northern Railroad, 55 miles northwest-west of Duluth. Founded in 1893, it received its charter as a city in the following year. Besides the agricultural resources of the region, there are over a score of iron-mines in the vicinity. Its industries embrace foundries, car and machine shops, lumber-mills and a brewery. Its public buildings, besides a city-hall, include the Lenont Hospital, a Carnegie Library and the Roosevelt High School. Population about 6,500.

Virginia, University of, an institution of higher learning (undenominational) at Charlottesville, Va., near Monticello, the home of Thomas Jefferson, who was much interested in it and was its rector (1819–26). It has an attractive group of buildings, planned by Jefferson, its rotunda being modelled after the Roman Pantheon. Today the university comprises 25 schools, grouped into two academic and four professional departments, its courses being purely elective. It awards no honorary degrees, only those conferred upon examination after residence. These embrace the degrees of bachelor of arts and master of arts, doctorates of philosophy, law and medicine; it also gives courses in civil, mechanical, electrical and mining engineering. It has an income of about $160,000 yearly. In 1906 it had 725 attending students, with 75 professors and instructors. Its library contains 60,000 volumes.

Vir'gin Islands, a group of over 30 islands lying east of Porto Rico, in the West Indies, with an area of 58 square miles. About one fourth of them are inhabited. Sugar, molasses, cotton, salt, turmeric, pimento and ginger are among the products. Most of the islands belong to Great Britain, and since 1872 are included with the Leeward Islands, the president of the British Virgin Islands being under the authority of the governor of the Leeward Islands. The other islands of the group belong to Denmark, except Crab Island, which is owned by Spain. Columbus discovered the islands in 1494. They were secured by Britain by settlement in 1635, shortly after the British occupation of the Bahamas. The chief town is Roadtown on Tortola Island. The other principal islands of the group are Anegada and Virgin Gorda. To Denmark belong Santa Cruz, St. Thomas and St. John. Population 4,691.

Virgin Mary. See MARY.

Viscos'ity of Liquids, a term employed in physics to describe a kind of friction between the particles of a liquid when the various parts of the liquid are moving with different velocities. If a surface of area, A, in the liquid be chosen in a plane parallel to one of the fixed walls of the vessel, then the viscosity of the liquid is expressed as follows: Let V denote the velocity with which the liquid is moving at the surface A; and let D be the distance from the surface A to the fixed parallel wall.

Then if R is the tangential resistance experienced by the plane A,

$$R = \frac{n A V}{D}$$

where n is a constant for any one liquid and is called the *coefficient of viscosity* for that liquid. This coefficient is the measure of the viscosity of any liquid. It is the viscosity of water that causes waves to die down after a storm.

Vish'nu, one of the Hindu gods, belonging to their trinity, which consists of Brahma, the creator; Vishnu, the preserver;

and Siva, the destroyer. In the *Rig-Veda*, a sacred book of the Hindus, he is considered to represent the sun. In his character as preserver of the world he has descended several times, to set it right. These appearances are called *avatars*, in which the god is supposed to have taken the form of some animal, god or man. There usually are ten of these *avatars* mentioned, such as the man, the lion, the fish, the dwarf, the Buddha. One more appearance is looked for, when the close of the present age shall be nigh. Vishnu is represented with four hands, holding a shell to be blown in battle; a disc, an emblem of power; a mace, a symbol of punishment; and either a lotus flower or a sword. He is sometimes represented floating on a serpent, seated on a throne, or riding on an animal half bird and half man. Consult Moor's *Hindu Pantheon*.

Vis'igoths. See GOTHS.

Vision (*vĭzh'ŭn*). See EYE.

Vis'tula, a river of Europe which rises in Austrian Silesia and, crossing Russian Poland and Prussia, flows into the Baltic Sea at Dantzic. It is navigable to Cracow, 550 miles, and 100 miles below its source. At Vistula in Silesia there are falls of 200 feet.

Vladimir (*vlăd'ĭ-mĕr*) **the Great,** a Russian ruler, who reigned from 980 to 1015. He added largely to the kingdom by conquest, but is best known for the introduction of Christianity into the Empire. He embraced the doctrines of the Greek church, and was baptized at Constantinople in 988, the day after his marriage to the sister of the Byzantine emperor. He died in 1015.

Vladivostok (*vlă'dyĕ-vàs-tôk'*), the chief naval station of Russia in Siberia, is on the Gulf of Peter the Great in the Sea of Japan. It is situated on the point of a peninsula called the Golden Horn, on a strait named the Eastern Bosporus, with one of the finest harbors in the world. The climate is severe, but the gulf is frozen only along the shores, even in December. The navy workshops have been established at Vladivostok, which, with the discovery of gold in the neighborhood, has increased the importance of the place. Some 3,000 or 4,000 Koreans are employed in gathering seaweed, which is sent to the Chinese markets. The city is connected by submarine cable with Nagasaki and Shanghai; and in 1897 that section of the great Siberian railway (*q. v.*) was completed which brought Vladivostok into communication with the rest of the Russian empire. There also is a series of military posts and telegraph lines. Population 38,000.

Vo'cal Mem'non. On the western side of the Nile near the temple of Luxor we find the ruins of the *Memnonium* or great temple of Amenophis III. Very little is left; but two huge, seated colossi 60 feet high of Amenophis III still remain in defiant grandeur. These statues attracted little or no attention until 27 B. C., when the upper part of one was broken off by an earthquake, and after that it was observed that the remaining bulk gave forth a prolonged wail when wet with morning dew and warmed by the rays of the rising sun. The vocal Memnon became a great factor in Greek mythology, as the Greeks and Romans were frequent travelers in Egypt in those days. See TEMPLE OF KARNAK and TEMPLE OF LUXOR.

Vogt (*fōgt*), **Karl,** a German naturalist, was born at Giessen, July 5, 1817. At Neufchatel he studied natural history for five years under Agassiz. He was made professor of natural history at Giessen in 1847, but lost his position and had to leave Germany because of his zeal in the revolutionary movements of 1848. In 1849 he was made professor of geology at Geneva, and held that position to the time of his death, May 6, 1895. He claims to have written the first volume and a part of the second of Agassiz's *Natural History of Fresh-Water Fishes*. He also wrote *Studies in Geology and Petrifactions; Man, His Place in Creation and in the History of the Earth; Essays on the Darwinian Theory;* works on physiology, zoology, anthropology and geology; and many scientific papers. His work on *Faith and Science*, published in 1855, is best known, and has been severely criticised for its supposed atheistic tendencies.

Voice is the sound produced by the movements or vibrations of the vocal cords in the larynx. The larynx is in the neck, between the trachea or windpipe and the pharynx, that part of the throat directly behind and below the mouth. The vocal cords are two elastic bands fastened across the larynx between which the air from the lungs passes out. The arrangement resembles two strips of india-rubber stretched across the mouth of a glass-tube, into which air is forced by a bellows, which would cause the edges of the rubber strips to vibrate with sufficient rapidity to produce a sound, the pitch depending upon the number of vibrations in a second. The first thing necessary to produce a sound is the expulsion or driving out of the air through the glottis or opening between the vocal cords; and the second necessary condition is that the cords should be close enough together and tight enough to vibrate rapidly. All the variations between high and low notes are produced by changes in the width of the opening and in the tension or tightness of the cords. If the cords are more than one tenth of an inch apart, there will be no sound. The pitch of the voice, depending upon the number of vibrations in a second, is determined by the length, size and ten-

sion of the cords. The pitch of the male voice is lower than that of the female voice, because the cords are longer. A boy's voice breaks and falls about an octave at the period of life when the cords lengthen; and in old age the voice changes, because the muscles which move the cords lose their elasticity. Hoarseness is caused by roughness or swelling of the cords. The ordinary range of the voice is two octaves, while the ear can perceive musical tones for 11 octaves. The quality of the voice depends upon the strength and elasticity of the vocal cords and also upon the shape of the passages of the ear, throat and mouth through which the sound passes, a slight difference in these respects causing the same varieties of tone etc. in the human voice as in a musical instrument. Voice differs from speech, which is the production of sounds to express ideas. Animals have voice without speech. In speech the tones produced by the voice are changed by the action of the organs of the throat and mouth, as the tongue, lips, teeth palate etc., into a large number of simple sounds, which, put together, form words. These vocal sounds are divided into vowels and consonants, the different combinations of which produce the hundreds of thousands of words which form the languages. See *Human Physiology* by Carpenter and *Voice, Song, and Speech* by Browne and Behnke.

Vol'apük' is the name given to an artificial language which Johann Schleyer of Baden invented in 1879. It was intended for use as an international speech. The words which form the vocabulary of Volapük are constructed from an aggregate of words belonging to the different European languages, especially English. In order that the language may be easily learned, local elements and inflexions are discarded. Austria was the first nation to welcome Volapük to any considerable extent, and the language soon spread to France, the Netherlands, America and England. The weakness of Volapük is that it begins without a history; and, therefore, without authority. Thus its usefulness is diminished by the large number of modified and rival world-languages, which have been stimulated by the example of its success. In Volapük there are 27 sounds, represented by a ä e i o ö u ü b c d f g h j k l m n p r s t v x y z. Most of these letters have their usual continental values; but c is like English j in *jib*, h like the final ch in German, j like the English sh, v like the English w in *we*, y like the English y in *you* and z like the English ts.

The words in Volapük are formed from the simplest roots; and may be built into compound forms by prefixes and suffixes which have a constant value. Thus *ik* is the adjectival affix; *ön* the infinitive affix; and so on. Nouns are inflected in the genitive, dative and accusative singular by adding a, e and i respectively; and in the nominative, genitive, dative and accusative plural by adding respectively s, as, es and is.

In 1884, 1887 and 1889 international Volapük conferences were held; and a controlling academy was established in 1887. The directors of this academy during 1893–1903 were, first, Mr. W. Rosenberger and, afterwards, the Rev. M. A. Holmes. Under their leadership the academy modified Volapük into *Linger International* or *Idion Neutral.* The literature on Volapük in English includes Dornbusch's *Abridged Grammar of Volapük;* Sprague's *The International Language;* Seret's *Grammar with Vocabularies of Volapük;* and Hain's *Grammar of Volapük.* See ESPERANTO.

Volca'noes, vents in the earth's crust from which lava is ejected. The lava may flow out quietly, or it may be ejected forcibly. In the latter case much or all of it may be solid. Small fragments of solid lava are called cinders, but if they are as small as particles of fine sand or dust, they are called ashes. Volcanic ash does not, however, imply combustion. It is nothing more nor less than powdered lava. Besides the lava which issues from volcanoes, either in the liquid or solid form, many gases or vapors escape from the vents. Among the latter vapor of water is most abundant. Steam is, indeed, the principal force in the violent expulsion of materials from volcanoes of the explosive type. Chlorine and sulphur and various compounds of these substances are among the commonest fumes escaping from volcanic vents. Carbonic acid gas is also one of the common gases. Many of the gases are noxious, so that it is sometimes difficult to approach the openings whence volcanic products issue.

The solid material and the liquid lava which escape from volcanoes accumulate about the vents, and build up volcanic cones. In the top of a volcanic cone there generally is a depression, the *crater*, in the bottom of which the vent is situated. When a volcanic cone becomes high, the lava may break through its sides instead of flowing over the top. Cones built up by lava flows have low slopes, often less than 5°, and rarely so much as 10°; cones built up by cinders often have steeper slopes, but rarely more than 25° or 30°. When a volcano ceases to be active, it is said to be extinct, if the quiescence be permanent. When it becomes extinct, however, it really ceases to be a volcano. When the activity of a volcano is temporarily suspended, the volcano is said to be dormant; but it is often difficult to tell whether a volcano is extinct or only dormant. Vesuvius was thought to be extinct until the time of its destructive eruption in 79 A. D. When this occurred, it was seen that the volcano

had been dormant only instead of dead. A volcanic vent often continues to give off vapors and gases long after the lava ceases to issue. Vapors and gases also escape, and often in quantity, during periods when no lava is ejected.

When volcanoes cease to be active, their craters may be occupied by water, giving rise to crater lakes. Such a lake, Crater Lake, exists in Oregon. Volcanic cones retain their perfect form for a short time only. Erosion by rain and melting snow soon modifies them. Volcanic cones in all stages of degradation occur in many mountainous regions. Mt. Shasta in California, Mt. Ranier in Washington and San Francisco Mountain in Arizona may serve as examples of volcanic mountains in process of degradation. In southern California and northern Arizona there are volcanic cones so recently formed that they have been modified scarcely at all by erosion. In many of them the craters are still preserved. These fresher cones are largely of cinders.

Volcanoes are often associated with earthquakes, and the violent eruptions of volcanoes are often the direct cause of earthquakes. In many cases, however, it may be true that the two phenomena, the earthquakes and the volcanic eruptions, are to be referred to a common cause rather than either to the other. In the explosive eruptions of Vesuvius the quakings are felt for considerable distances from the crater. In many cases of violent eruption the old cones are partly or wholly blown away. Even large parts of the islands where they occur may be demolished. Outside the present cone of Vesuvius there is a remnant of an older cone, partially destroyed in a violent eruption subsequent to its formation. A large part of the Island of Krakatoa was blown away in the eruption of the volcano of the same name.

The great destructiveness of volcanic action is more commonly due to the material blown out than to the lava, which flows out. The flow of lava usually is slow, and in most cases it flows but a short distance before it congeals. But the solid matter may be widely distributed. It was by ashes ejected from Vesuvius that Pompeii, with its 2,000 people, was buried in 79 A. D. Torrents of rain, due to the condensation of the escaping water-vapor, often fall with the ashes, converting them into a sort of hot, fluid mud, and this is sometimes most destructive in its flow. In the Krakatoan eruption of 1883 it has been estimated that bits of pumice and dust were sent up into the air 20 miles. Sent up into the upper air by the violent explosion, some of the dust was carried by air-currents completely around the earth. Large blocks of lava are sometimes hurled miles from the volcano whence they are ejected.

The number of active volcanoes is estimated to be between 300 and 400. About one third of the active volcanoes are situated on the continents, the others on islands. Most of the volcanoes on continents are relatively near their borders, though extinct volcanoes occur at great distances from the coasts. Continental volcanoes are, on the whole, more numerous about the borders of the Pacific Ocean than about the Atlantic. Many islands are really nothing more than the crests of volcanic cones which have been built up above the surface of the water. There are doubtless very many volcanic cones the tops of which are still below sea level. Of such submarine volcanoes little is known. The lava which issues from volcanoes comes from the interior of the earth, but from what depths is unknown. Active volcanoes are more numerous in regions where the formations are relatively young than where they are old. They are thought to occur in regions where the crust of the earth is in movement, that is, where it is either sinking or rising, rather than in regions where it is stable.

No existing volcano seems to have been active for a period of time which would be considered long, as geologists reckon time, though many of those now known have been active since the beginning of the historic period. There however, is reason to believe that all existing volcanoes will in time cease to erupt and new ones will doubtless come into existence. Volcanoes have been more numerous at some stages of the earth's history than at others, but some of the periods of great volcanic activity were early in the earth's history, and some late. On the whole, it cannot be affirmed that volcanic activity has increased or decreased as the history of the earth has advanced.

References: Judd's *Volcanoes;* the topic *Volcanoes* in text-books on geology; Russell's *Volcanoes of North America;* Geikie's *Earth Sculpture* and Dana's *Volcanoes.*

R. D. SALISBURY.

Vol'ga, a river in Russia, which rises in the western part of the country in the Valdai Hills, and by a winding course crosses Russia and flows through many mouths into the Caspian Sea. It is the longest river in Europe, being 2,320 miles in length. It is connected by canals with the Baltic and White Seas.

Vol'ta, Alessandro, an Italian physicist, the inventor of the Voltaic cell, was born at Como, Feb. 18, 1745, where also he died, on March 5, 1827. From 1779 to 1819 he occupied the chair of physics in the University of Pavia.

His discovery of the electric pile (as the form of battery which he devised was then and is still called) begins with the division of all conductors into two classes, *viz.*, con-

ductors of the first class, which become electrified by contact, but in such a way that equilibrium is at once established without any permanent current; and conductors of the second class — what we now call electrolytes. Volta's discovery is that, whenever two conductors of the first class are joined in series with a conductor of the second class, an electric current flows through the closed circuit. This phenomenon was first reported by letter to Sir Joseph Banks, then president of the Royal Society, on March 20, 1800, and was read before the Royal Society on June 26, 1800. The centennial of this important discovery was recently celebrated by an electrical exposition at Como. Volta is also the inventor of the electrophorus and of an absolute electrometer. See ELECTRICITY.

Voltaire (*vol-târ'*), **François Marie Arouet,** a famous French writer, was born at Chatenay, France, Nov. 21, 1694. His father's name was Arouet. After studying at Paris and in his father's law office, he began his career as a literary man. He spent a year in the Bastile imprisoned on suspicion of having written some verses which reflected on the government, and there finished his *Œdipe*. On leaving prison he changed his name to Voltaire, which is probably an anagram on his original name. His tragedy was successfully brought out in 1718, but *Artémire* was hissed off the stage. On a visit to Holland he met Rousseau, of whom he made an enemy by a sarcastic reply to Rousseau's question: "What is your opinion of my *Ode to Posterity?*" "It is a letter that will never reach its address" was the answer. His visit to England, which was an exile, introduced him to the literary men and the literature of England. Through the favor of Queen Caroline, who headed the list of subscribers, his *Henriade* brought him nearly $40,000, making him independent of the great men in France whose patronage had been so injurious to him. In 1729 he was allowed to return to France where *Brutus*, *Eriphile* and his best play, *Zaïre*, were produced at intervals. His *English Letters*, reflecting on everything in church or state in France, under the pretense of praising England, brought out in 1733, was condemned and burned, he himself being safely out of the way in Lorraine, where he lived for 15 years with Madame du Châtelet, writing and studying Newton's *Principia*. His *Mérope* and *Mahomet*, among his best plays, belong to this period, as does his *Age of Louis XIV*.

His life at the Prussian court, as the friend of Frederick the Great lasted three years, with the jealousies, squabbles and court-quarrels which Voltaire always succeeded in falling into. Being refused permission to return to France, he bought Ferney, an estate four miles from Geneva, which was his home for the last 20 years of his life. Here he was visited by many of the most celebrated men of Europe, carried on an immense correspondence, rescued from want and educated a niece of Corneille, interfered in several cases of oppression and injustice, and adopted a young girl whom he had rescued from a convent. After the death of Louis XV he was permitted to return to Paris, and on Feb. 10, 1778, he entered the city after 28 years of exile. He was received with enthusiasm, and crowned with laurel at the theater where his new play *Irene* was produced. He died at Paris, soon after, on May 30, 1778. His works fill about 90 volumes, including the tragedies *Zaïre*, *Mérope* and *Mahomet*, which give him a place with the best French dramatists; historical works, which embrace *Charles XII*, *Louis XIV* and *Peter the Great;* and philosophical works, poems, criticisms and miscellaneous writings. See *Life* by John Morley.

Voltam'eter, an electrical instrument, of galvanometer type, for measuring in volts the differences of potential between different points of a circuit of electricity. The various forms of the voltmeter are adaptations, more or less, of the D'Arsonval galvanometer, in portable form; and in experiments with it it will be found that, with a high resistance in the circuit, the current will be proportional to the difference of potential.

Vol'unteers' of America, The, an organization, on the model of the army of the United States, was founded and incorporated in 1896 by General and Mrs. Ballington Booth for religious and philanthropic work akin to that done by the Salvation Army. The Volunteers seek affiliation with the churches and religious denominations of the country, and many Volunteers are practically engaged with the churches in their good and laudable work in most of the chief cities and larger towns of the Union, which are grouped by the organization into sectional or regimental divisions under the control and oversight of 30 principal staff-officers. The scope of the work undertaken by the Volunteers may be gathered from the fact that they maintain reading-rooms in the chief centers, whence Christian literature is distributed in prisons, hospitals, soldier's and children's homes, besides supplying these with Thanksgiving and Christmas dinners. They also maintain boys' fresh-air camps and girls' sewing classes, furnish hospitals with nurses, and, where there is need, afford temporary financial relief. For this good work the Volunteers have organized and maintain philanthropic institutions in the principal cities of the United States, in addition to their chief centers of labor in New York, Philadelphia, Boston, Pittsburgh, Denver, Chicago and San Francisco. See SALVATION ARMY.

Voo'dooism, a term referring to beliefs and practices currently considered to pre-

vail among the negroes of the West Indies and the southern United States. But careful research has disproven any organized set of beliefs and ceremonials which could properly be regarded as a voodoo religion. The practices were supposed to have been imported from western Africa. A great snake (Voodoo) was the central figure, communicating with his worshipers only through a priest or priestess, who was held in great veneration by all devotees. Secret nocturnal ceremonies were characterized by prayers to the snake, dancing and the wildest debauchery and indecency. Voodoo doctors among southern negroes were often called to help destroy an enemy, for they were skillful poisoners. Their magic works were performed in secret.

Voorhees (*vōr'ēz*), **Daniel W.,** an American politician, was born in Ohio Sept. 26, 1827. He studied at Asbury University in Indiana, and began his law practice in that state, where he was appointed district attorney. He was a representative from Indiana for four terms of Congress, became United States senator in 1877, and was reelected in 1885 and 1891. He died on April 10, 1897.

Vosges (*vōzh*), a range of mountains on the left bank of the Rhine, in northeastern France and western Germany. The tops are rounded and called balloons, and are covered with snow for several months in the year. Mines of iron, lead, salt and copper abound.

Vot'ing-Machine, a mechanical apparatus, automatically arranged, for use in voting, and devised primarily in the interest of ballot-reform to lessen fraud in the casting and counting of votes. The introduction of the voting-machine has greatly simplified and shortened casting the vote, and their use in recent years and in various types has been widespread. The authorized use of these devices dates about from 1892, and those now in large use are the McTammany (Massachusetts) ballot-machine; the Myers American ballot-machine, first legalized in New York State; the votograph or American ballot-protector and recorder; the Rhines, first legally used in Michigan; the Bardwell votometer; and the Standard. The methods of working these instruments are various, and on the whole suitable, and are a vast improvement on the old methods of casting paper-ballots. The general principle of all is much the same, viz.: the push-button one; and their advantages, besides those of secrecy and simplicity of voting, include impossibility of multiple voting as well as the prevention of fraud in counting the cast votes.

Vul'can (Greek, *Hephæstus*), in Roman mythology the god of fire, was the son of Jupiter and Juno. He was deformed in his feet from his birth, according to some stories, while others assert that his lameness was due to his being hurled down to earth by Jupiter for interfering in a family quarrel. He fell on the Island of Lemnos, where he built a palace, with a workshop and anvil. He also had a beautiful palace in Olympus or, according to others, in the heart of an island, where with the help of the Cyclops he made the scepter for Jupiter, the armor of Achilles and the weapons of Hercules. There were a temple to him at Rome and a raised square outside the city, called the *Volcanol*, where statues of persons struck by lightning were sometimes placed. There also were several festivals in his honor.

Vul'gate, The, is a Latin translation of the Bible which originated in the second century, probably in the Roman province of Syria. The Vulgate appears to have originated out of a number of different Latin translations which were intended rather for private use than for publication. This being the case, there soon were many Latin versions, which often contained dangerous interpolations as well as corruptions. Accordingly the task of a revision of these versions in the light of the original Greek was entrusted by Damasus, Bishop of Rome, to St. Jerome. The Vulgate of St. Jerome appeared about 384 A. D. Owing to the multiplication of manuscript copies, this text also became very corrupt. Alcuin in 801 and Lanfranc about 1070 undertook revision of it. The best extant manuscript of Jerome's Vulgate is the *Codex Amiatinus* at Florence, which dates perhaps as early as the seventh century. The Vulgate was revised by the authority of the papacy in 1590 and again in 1592. The edition of 1592, known as the Clementine Vulgate for Pope Clement VIII, is the standard Bible in the Roman Catholic church. The most recent critical edition of the Vulgate is that of Wordsworth and White. The Latin of the Vulgate is excellent, and bears the mark of close collation with the Greek version. The language, however, although idiomatic, is not always classical, but occasionally includes later ecclesiastical words and phrases. In some instances it is probable that the Latin version is earlier than the extant Greek. The Vulgate powerfully, though indirectly, influenced the Authorized Version in English, through Wiclif's translation, which was directly from the Vulgate, and through the Douai New Testament.

Vul'ture, the common name for various carrion-eating birds of the Old World. They are birds from two to four feet long, and the largest of them have an expanse of wing from nine to ten feet. Their head and part of the neck are destitute of feathers. There are six species more or less common about the shores of the Mediterranean. Two of these inhabit Africa, and the other four

are found in Europe. There the crested black vulture is the type; it is one of the large vultures, reaching a length of nearly

EGYPTIAN VULTURE

four feet. It ranges east through Asia to China and south into northern Africa. Other common species are the griffon, the Nubian or eared vulture and the Egyptian vulture. These birds are called the true vultures; they are closely related to the eagles and to buzzards. A number of American birds, belonging to a different family, are also called vultures. They include the black vulture or carrion-crow, the turkey-buzzard and the California vulture. The American vultures are found chiefly in the southern states. The turkey-vulture or buzzard, a large, blackish-brown bird with a red head, is a very familiar bird of the south, protected by law because of its services as scavenger and its harmlessness, not preying upon barnyard fowls. This bird is gregarious. Large companies are to be seen about rubbish heaps at edge of southern towns or soaring high over fields. The black vulture or carrion-crow also is very common in the south, and is a great scavenger. It is smaller than the preceding, but has a heavier body. Its flight lacks the grace that marks the soaring of the turkey-buzzard. It is very bold, and troops of crows walk about the streets of southern towns. See CONDOR, CROW (CARRION) and TURKEY-BUZZARD.

W

W (*dŭb'l ū*), the twenty-third letter, is a consonant usually, but sometimes a semivowel. Being made at the lips, it is classed as a voiced or sonant labial, as in *we, inward*. *W*'s close relation to *o͞o*, for it begins with this sound, makes it a semivowel, as in *war, woe, woo*. It is a consonant when beginning a word or syllable, a vowel when ending either. *W*, if not silent, is always followed by a vowel in the same syllable, as above. *W*, after a vowel in the same syllable and before r, is silent as a consonant, as in *glow, wring*. *W* first came into use in the 13th century. Before *v* was specialized as a consonantal sign, *w* was called "doubled v," and from this it takes its shape. Its name, however, comes from *u* doubled. Some uneducated Englishmen, especially in London, confuse *v* and *w*, saying *weal* for *veal, vine* for *wine*. Even well-educated Englishmen pronounce *when* as *w'en*.

Wabash (*wą'bȧsh*), **Ind.,** a city, the seat of Wabash County, on Wabash River, and on the Wabash and the Cleveland, Cincinnati, Chicago and St. Louis Railroad, 40 miles southwest of Fort Wayne. Settled in 1837, it was incorporated the same year, and had its charter as a city in 1865. Among its public institutions are the Memorial Hall, Masonic Temple, a Woman's Orphan Home, besides municipal and school buildings, churches, a library and a county hospital. Besides the railroad shops of the "Big Four" road, its industries include church and school furniture, cabinets, bridge and iron works, manufactures of hats, cash-registers, paper and paper boxes, shafting, harness, carts, sleds and wagons. Population 9,944.

Wabash, a river of Indiana. It rises in western Ohio, runs through Indiana, forming for 100 miles the boundary line between that state and Illinois, and flows into the Ohio. It is 600 miles long, and is navigable for 300 miles.

Wacht am Rhein, Die (*wȧkht ȧm rīne, dē*). A modern German folk-song which was adopted as a national song during the Franco-Prussian War of 1870–1. The poem is by Max Schneckenburger (1819–49); the music by Carl Wilhelm (1815–73). The music was composed in 1854 as a part-song for men's voices, and obtained for the composer an annual pension of $150 in 1871. Previous to his attempt the words had received musical treatment from F. Mendel, Leopold Schröter and F. W. Sering, whose work never gained the hold upon the public accorded to Wilhelm's composition.

Wa'co, Tex., county-seat of McLenan County, is about 85 miles from Dallas. It is located in an agricultural region, the chief products of which are cotton and grain. It is quite important as a manufacturing city, and among its products are the saddlery and harness works, wagons and carriages, cotton-products, watches, foundry and machine-shop products, printing establishments etc. Waco has a number of medicinal wells, which attract tourists, the city's water-supply is excellent, and it enjoys all other modern improvements. Waco has excellent public schools, Baylor University (Baptist); Texas Christian University; St. Basil's College (R. C.); and Paul Quinn College (African M. E.). It has the service of six railroads and a population of 30,000.

Wade, Benjamin Franklin, an American statesman, was born at Springfield, Mass., Oct. 27, 1800. He studied law in Ohio, and was three times elected state senator, becoming United States senator in 1851, 1857 and 1863. He was known as a strong antislavery man, being one of six senators who voted to repeal the fugitive-slave law (*q. v.*). He also opposed all the measures proposed as compromises between the north and the south, and was influential in getting the homestead bill through Congress. After the death of President Lincoln, Wade was acting vice-president of the United States. He died at Jefferson, O., March 2, 1878.

Wads'worth, James, a New York pioneer, was born at Durham, Conn., April 20, 1768. He with his brother in 1790 bought a large tract of land in what is now the town of Geneseo, N. Y., and became one of the great landowners of the state. He was very active in promoting the interests of religion and education in the new state, publishing pamphlets, paying for lectures on education, and giving a premium to any town that started a school-library. A library was founded by him at Geneseo, and in all his land-sales he insisted that 125 acres should be set apart for a church and 125 acres for a school. He died on June 8, 1844.

Wagner (*väg'nĕr* or *wag'nĕr*), **Wilhelm Richard,** a German musical composer, was born at Leipsic, May 22, 1813. He was educated at Dresden and Leipsic, and in 1836

was made conductor of the opera at Magdeburg. *Rienzi* and *The Flying Dutchman* were composed at Paris, where *Rienzi* was unsuccessfully put on the stage, but at Dresden it made him a musical conductor. For his next opera, *Tannhäuser*, he went to the old German songs, but the work was only partially successful when brought out at Dresden. During the Revolution of 1849 in Saxony Wagner was prominent as a leader and had to flee to Zurich, where he lived ten years until allowed to return. *Lohengrin*, composed before he left Dresden, was produced at Weimar under the direction of Liszt in 1850, and in answer to Liszt's call for a new creation he began his collection of operas based on the *Nibelungenlied*. In order to bring out his festival stage play, as he called his Nibelungen collection of operas, he built a theater at Baireuth, Bavaria. Founded on the old German poem, it was a great success both in Bavaria and at London, where Wagner was present at its performance in 1877. His last and perhaps greatest work, *Parsifal*, founded on the story of the Holy Grail, was finished at Palermo in 1882. He died at Venice, Feb. 13, 1883, and was buried at his home at Baireuth. See HOLY GRAIL and NIBELUNGENLIED. Consult *Life* by Nohl.

WILHELM RICHARD WAGNER

Wagram (*vä'grăm*), a village in Austria, ten miles from Vienna, important as the site of the great battle between the Austrians and the French in 1809. Napoleon surprised the Austrians under Archduke Charles by crossing the Danube at night, and was at first driven back; but the next day the French, with a loss of 25,000, forced the retreat of the Austrians, who left 25,000 dead on the field. This battle was followed by the peace of Vienna, Oct. 14, 1809.

Wain'wright, Richard, American naval officer, was born at Washington, D. C., Dec. 17, 1849 (the son of Commander R. Wainwright, who died near New Orleans while commanding Farragut's flagship *Hartford*, Oct. 10, 1862). Young Wainwright entered the Naval Academy and graduated in 1868, when he was attached for a time to the brig *Jamestown* on the Pacific station. Later on he served on the Asiatic station, and after gaining a lieutenancy he did duty on the coast-survey vessel *Arago*. In September, 1894, he reached the rank of lieutenant-commander, and was executive officer on the battleship *Maine* when she was destroyed in Havana harbor (Feb. 15, 1898). After this he did good service at the battle of Santiago de Cuba as commander of the gunboat *Gloucester*, when Cervera's squadron was destroyed. He has since been in command of the ships of the United States navy at the Naval Academy, Annapolis, Md.

Waite, Morrison Remich, an American statesman, was born at Lyme, Conn., Nov. 29, 1816. He graduated at Yale and began practicing law at Maumee City, O., afterwards settling in Toledo. His reputation as a lawyer led to his being sent to Geneva, in 1871–72, as one of the counsel for the United States in the Alabama case. He presided over the constitutional convention of Ohio in 1873, and in 1874 was appointed chief-justice of the United States. He died at Washington, D. C., March 23, 1888.

Wake, from the Anglo-Saxon word meaning to watch, is a religious festival, once universal in England. The early churches were dedicated to a particular saint, and the festival was kept on the birthday of that saint. The day at the time was reckoned from sunset to sunset, so that the first part of the festival was the night-watch; hence the name. These festivals degenerated into fairs, because of the peddlers etc., who were attracted by the crowd, and became scenes of riot. They were forbidden to be held in the country churchyards by Edward I, and Henry VI abolished all selling at wakes, except of food, while Henry VIII made the first Sunday in October the day of the feast. The wake is still observed in some country parishes in England. The Irish wake is the custom of watching all night around the dead.

Wake'field, Mass., a town in Middlesex County, about nine miles from Boston. It is in a farming section, but like many Massachusetts towns it is also engaged in manufacturing. Its factories make pianos, shoes and flour, and it has brass and iron foundries, rattan works and machine shops. The town contains three villages, each of which has graded schools. There are one high school and a public library containing 15,000 volumes. Wakefield is on the Boston and Maine Railroad. Population 10,464.

Wake-Rob'in, the common name of species of trillium and also for the plant known as Jack-in-the-pulpit. There are several varieties of the trillium, which is a species of lily. They grow in damp woods from Canada to Georgia, and are among our best-known wild flowers. There is usually a long stalk with a cluster of three leaves with a single white or purple flower. The curious Jack-in-the-pulpit, which is called wake-robin in the south, has a large greenish or purplish spathe or leaf-like envelop, turning over like a hood, which incloses a

long, finger-shaped stem called the spadix. The calla lily belongs to the same family.

WAKE-ROBIN OR TRILLIUM

Waldenses (*wŏl-dĕn'sēz*) or **Vaudois,** a Christian denomination in Italy, founded about 1170 by Peter Waldo, a rich merchant of Lyons, who sold his goods and gave them to the poor, and then went forth preaching voluntary poverty. His followers were called the Poor of Lyons. They did not intend to secede from the church; but, thinking it utterly corrupt, they sought to bring it back to its primitive purity. When the archbishop of Lyons commanded them to be silent, they appealed to Pope Alexander III, but he also forbade their meetings. Waldo, however, continued to preach, and with his followers was excommunicated. His doctrines spread in Italy, France and Bohemia, and especially in the valleys of Piedmont, where the Waldenses were greatly persecuted during the 16th and 17th centuries. In 1680 they suffered at the hands of an Italian and French army, 3,000 being killed, 10,000 imprisoned, and 3,000 of their children being placed in different Catholic towns and villages. They had permission to emigrate the next year, and about 5,000 went from Piedmont to Switzerland, Holland, Brandenburg, Hesse and Württemberg. There are now ten congregations in Württemberg, with over 16,000 members. When all Italy was opened to them in 1858, they chose Florence as their center, removing there their theological seminary and printing press. They formed an Italian evangelical publication society in 1861, and have been especially active in printing religious books. They accept the Bible as their only rule of faith, but hold their *Confession of Faith*, published in 1655, as the most correct interpretation of it.

Waldersee (*väl'dĕr-zā*), Count **Alfred von,** a German general, in command of the allied forces in China during the Boxer rising of 1900, was born at Potsdam, April 8, 1832, and entered the German army in 1850. He served with distinction through the war of 1866, and was chief of the general staff in the Franco-German War; he succeeded Von Moltke as chief of staff in 1888, and in 1891 became commander of the ninth army-corps. In 1895 he was created field-marshal, and in August, 1900, was appointed to the chief command in China of the allied armies engaged in suppressing the Boxer disturbances at Pekin and in the province of Pe-chili. In 1874 he married an American lady, widow of Prince Frederick of Schleswig-Holstein. He died in 1904.

Wales, a part of Great Britain, is a peninsula on the western coast of England, lying between Bristol Channel and the Irish Sea. It is 136 miles long and about 90 wide, with an area of 7,442 square miles, making it about as large as Massachusetts. It has a broken coast-line of 360 miles, and is a mountainous country. The Snowdon Mountains in the north, the Plinlimmon and the Black Mountains are the main ranges, with peaks over 3,000 feet high. There are several small streams, and only one lake, Bala. The country abounds in minerals; copper, lead, iron, coal, zinc and silver are found, and remains of gold mines worked by the Romans. The climate is not severe, though somewhat cold and very damp. Butter, cheese, wool and grain are among the most important products, and iron and flannel are the principal manufactures. All children between the ages of five and fourteen are required to attend schools provided for them, which are practically free. In 1905-6 Wales expended over $1,000,000 on secondary and technical schools. Among the higher institutions are the University of Wales, consisting of the Aberystwith, Bangor and Cardiff Colleges; University College; St. David's College; St. Beuno's College; and colleges at Bala, Brecon, Llangollen and Trevesca. The people are of Celtic origin, and call themselves Cymri, the name Welsh being given them by the English. The English language is spoken in most of the large cities, but Welsh or Cymraeg, as they call it, is the language of the country. It is the best preserved of the Celtic dialects.

Wales was inhabited by three Celtic tribes when the Romans invaded it, but the latter never conquered it. It was in constant warfare with the Saxons and the Danes, paying tribute to Athelstan, king of England, and

later to Harold. William the Conqueror subdued it, and the English kings have ever since claimed possession of the country. In 1267 Llewellyn ap Gryffith was acknowledged prince of Wales by Henry III, but, refusing to obey the call of Edward I to Parliament, was attacked and defeated. In 1282 he rebelled again, was slain in battle, his brother David, who succeeded him, was executed as a traitor, and Wales was united to England. The title Prince of Wales has been given ever since to the oldest son of the English sovereign. Under Owen Glendower the Welsh made a final effort for freedom, the struggle lasting 15 years from 1400 till his death in 1415. Population 1,519,035.

Wales, Prince of (born 1865), heir-apparent to the British throne, also known as Duke of Cornwall and York. His parents are Edward VII, reigning king of the British Empire, and Queen Alexandra, oldest daughter of King Christian IX of Denmark. In 1893 he married Victoria Mary, daughter of the Duke of Teck, by whom he has six children, five sons and one daughter. See YORK, DUKE OF.

Wal'fish or **Walvisch Bay,** though a part of Cape Colony, is situated near the center of German Southwest Africa's coast. It has an area of 430 square miles, with a population of 997, of whom 144 are white. It has an excellent harbor frequented by whalefishers, and was made a British possession in 1884.

Walhalla (*văl-hăl'lȧ*) or **Valhalla** (the hall of the slain), in Scandinavian mythology the hall where were gathered the dead who had fallen in battle. The hall, according to the legend, was in Gladsheim (the house of joy), with a grove of golden-leaved trees around it. It was ornamented with shields and spears, and had 540 doors so wide that 800 people could walk abreast through them. Every morning the inmates marched out at the crowing of the cock, and fought furiously until noon, when all wounds were healed, and they sat down to a banquet with Odin, where they were waited on by the Walkyries or battle-maidens. See VALKYRIES.

Walker (*wä'kĕr*), **Amasa,** an American political economist, was born at Woodstock, Conn., May 4, 1799, and died at Brookfield, Mass., Oct. 29, 1875. His early career was spent chiefly in commercial pursuits, but for six years (1842-8) he lectured on political economy at Oberlin College and subsequently (1859-69) at Amherst. In 1848 he was a member of the Massachusetts assembly, and in the following year member of the state senate. In 1862-3 he sat in Congress as member (Republican) for Massachusetts. He was a zealous advocate of temperance, was active in the antislavery movement, and was one of the founders of Free Soil party. He was an authority in finance, and wrote a series of articles on political economy. In 1857 he published a work on the *Nature and Uses of Money*, and in 1866 issued *The Science of Wealth*.

Walker, Francis Amasa, American statistician and political economist, was born at Boston, Mass., July 2, 1840, and died there Jan. 5, 1879. Graduating from Amherst in 1860, he took part in the Civil War and in 1865 rose to the brevet-rank of brigadier-general of volunteers. He was wounded at Chancellorsville, and for a time was an inmate of Libby Prison. In 1871-2 he was United States Indian commissioner; he was also chief of the bureau of statistics at Washington and superintendent of the 9th and 10th United States censuses. From 1873 to 1881 he was professor of political economy in the Sheffield Scientific School at Yale, and in 1881 became president of the Massachusetts Institute of Technology at Boston. In 1898 he acted as United States commissioner to the international monetary conference at Paris, and in the same year was elected to the National Academy of Sciences and made an honorary fellow of the Royal Statistical Society of London. His published writings include *The Indian Question; The Wage-Question; Money; Money, Trade and Industry; Land and Its Rent; Political Economy; Bimetalism;* and a *History of the Second Army-Corps*.

Walker, Robert James, American statesman and financier, was born at Northumberland, Pa., July 19, 1801, and died at Washington, D. C., Nov. 11, 1869. Graduating at the University of Pennsylvania in 1819, he studied law and practiced first at Pittsburg, Pa., and then at Natchez, Miss. Here he came into notice as an opponent of nullification, and from 1836 to 1845 was United States senator from Mississippi. In 1845 he was secretary of the treasury in Polk's cabinet, and prepared and carried what was then known as the Walker tariff (*q. v.*). In 1857 he became governor of Kansas, and in 1863-4 was financial agent of the United States in Europe. Throughout the Civil War he remained loyal to the Union and advocated vigorous measures for the suppression of the rebellion. In later years he practiced law at the capital.

Wallace (*wŏl'lâce*), **Alfred Russel,** a distinguished English traveler and naturalist, was born at Usk, Monmouthshire, Jan. 8, 1823, and received his education at the grammar-school at Hertford. From an early age he manifested a great love of nature, with marked scientific tastes. This bent was greatly developed in a voyage he made, in company with W. H. W. Bates, a naturalist, to South America, an account of which he has given us in his *Travels on the Amazon and the Rio Negro*, with a fund of material on the physical aspects of these great water-

systems, enriched by valuable botanical and ornithological collections. Of this voyage we have further results in his *Palm-Trees of the Amazon and Their Uses* and *Tropical Nature*, dealing with the colors of bird, animal and insect life and with the geographical distribution of plants and animals, sexual selection etc. A prolonged visit to the Malay Islands (1854–62) is the source of his work on *The Malay Archipelago*, published in 1869. This and a volume entitled *Contributions to the Theory of Natural Selection* give him place alongside Darwin as an exponent of evolution — his views on natural selection and variation being, like Darwin's, an explanation of the mode of origin of existing species of animals and plants. A little volume (issued in 1889), explains his theories in regard to evolution and Darwin's work: the volume is entitled *Darwinism*. Two other works from his pen also throw valuable light on the evolutionary theory, *viz.*, *Natural Selection* (1870) and *The Geographical Distribution of Animals* (1876). For these labors, Doctor Wallace received the founder's gold medal of the Royal Geographical Society, the gold medal of the Linnæan Society and the first Darwin medal of the Royal Society. Among his other published works are a volume on *Australasia*, contributed to Stanford's *Compendium of Geography and Travel; The Wonderful Century, Its Successes and Its Failures* (1898); *Island Life* (1880); *Miracles and Modern Spiritualism* (1874); *Bad Times* (1885); and *Land Nationalization* (1882), expressing his views as a social reformer. See *Autobiography* (1905).

Wallace, Lewis, an American general and writer, was born at Brookville, Ind., in 1827. His military service was in the Mexican War and in the Civil War, where he commanded a division at the capture of Fort Donelson, and guarded Cincinnati when besieged by Gen. Kirby Smith. In July, 1864, though defeated by General Early who was marching on Washington, his attack detained the Confederate forces until Grant had re-enforced the capital. He was governor of New Mexico from 1878 to 1881 and minister to Turkey from 1881 to 1885. His writings include *The Fair God*, a story of the conquest of Mexico; *Life of Benjamin Harrison, The Boyhood of Christ, The Prince of India* and the most popular of his works, *Ben Hur, a Tale of the Christ*. He died on Feb. 15, 1905.

GEN. LEW. WALLACE

Wallace, Sir **William,** the most popular national hero of Scotland, was born about 1270. While studying at Dundee, so tradition relates, he killed a young Englishman in revenge for an insult, and was outlawed. He gathered around him a band of desperate men, whom he led in attacks on the English. His followers and his successes increased until the English king recognized it as an insurrection, and sent an army against the insurgents, when most of the nobles deserted Wallace. He fled to the north, soon collected another army, and drove the English from Scotland, and was chosen guardian of Scotland in 1297. The English renewed the contest, and, the Scottish nobles again deserting, Wallace was defeated at the battle of Falkirk, 1298, and a price put upon his head. He was captured and executed as a traitor, Aug. 22, 1305, though he denied the accusation of treachery, saying he could not be a traitor to the king of England, as he had never been his subject. Consult Jane Porter's *The Scottish Chiefs; Early Days of Wallace* by Bute; *Life* by Carrick; and *Tales of a Grandfather* by Sir Walter Scott.

Wallachia (*wŏl-lā'kĭ-ȧ*). See RUMANIA.

Walla Walla (*wŏl'lȧ wŏl'lȧ*), (meaning Many Waters), **Wash.,** a city on Walla Walla River, capital of the county of the same name, in southeastern Washington, 245 miles east of Portland, 75 miles southwest of Lewiston, Idaho, and 125 miles south of Spokane. It is the seat of a United States military post and of the state penitentiary. Here, also, are located Whitman College and a number of important educational institutions. Walla Walla is a considerable trade-center, especially for the region about (an agricultural, fruit-growing and stock-raising one), including northern Idaho and northeastern Oregon. It is situated on the Union Pacific Railroad. The city has ample waterpower and a number of manufactories, including flour-mills, foundries and machine-shops; lumber, sash, door and blind factories; iron and wire-fence works etc. Population 18,000.

Wallenstein (*wŏl'lĕn-stīn*), **Albrecht Eusebius von,** was born in Bohemia, Sept. 24, 1583. After the death of his parents, who were Protestants, he was sent by an uncle to the Jesuit College at Olmütz, where he joined the Roman church. His studies at Altdorf, Bologna and Padua resulted principally in a faith in astrology and trust in the stars. He served in the Hungarian army and on the side of the emperor in the troubles in Bohemia, securing in the confusion the large estates belonging to his mother's family and confiscated lands, which he formed into a state called Friedland; and in 1623 he was given the rank of prince. In 1626 Wallenstein raised an army of 30,000 men for Emperor Ferdinand, and joined with Tilly, the great

German general, against Christian IV, who was obliged to accept terms of peace in 1629, though Wallenstein had failed in his plan of reaching the sea and destroying the naval power of Scandinavia and of England. He secured for himself the duchy of Mecklenburg. His success, ambition and arrogance made the princes of the kingdom combine against him, and to prevent civil war the emperor in September, 1630, removed him from the head of the army; but with the advance of Gustavus Adolphus he was recalled, and in 1632 with an army of 40,000 men he drove the Saxons from Bohemia and attacked the Swedish army at Nuremberg and Lützen, where, though Wallenstein's forces were defeated Gustavus Adolphus was killed. Wallenstein failed to follow up the advantage this gave the Austrians, as he was secretly negotiating with Saxony, Sweden and France, with the condition that he should be given Bohemia. He had blind confidence in his army and in his destiny, as foretold to him by his astrologers, and did not realize his danger, though knowing that the emperor knew of his plans, until an order was issued at Prague, charging him with treason, and naming his successor. He fled with 1,000 followers to Eger, where he was assassinated on Feb. 25, 1634. Though the deed was not ordered by the emperor, the murderers were rewarded. Schiller made his career the subject of a tragedy, translated by Coleridge as *Wallenstein's Death*. Consult *Life* by Mitchell; *The Thirty Years' War* by Schiller; and *The House of Austria* by Cox.

Walloons (*wŏl-lōōnz'*), the name of the people living in southeastern Belgium, who differ from the rest of the Belgians by language and by their darker color. They are descendants of the *Belgæ*, a tribe of Gauls, who held their ground among the Ardennes Mountains when the rest of Gaul was overrun by German conquerors. Their language is a French dialect, with a large proportion of Gallic words. The name Walloon, that is, foreign, was given them by their Flemish neighbors. They are steadily increasing in numbers, and are likely soon to overbalance the Flemish population of Belgium, as they already take the lead in everything except music and painting. They number about two and one half millions.

Wall Street. A street in New York City extending from Broadway to East River following the line of the early city-wall across Manhattan Island. It at present is the center of financial operations in the United States. The term Wall Street is commonly used to designate the community of financial interests located there, including among others the stock exchange; produce, cotton, coffee and consolidated exchange, the United States subtreasury, assay office and custom house, the New York clearing house, a multitude of national and state banks, trust companies, private banking firms, import and export houses, dealers in commercial paper and promoters, representatives of railroad and industrial corporations and vast private estates; the curb market and hundreds of corporation lawyers and others who have close relations with security markets. There railroad and industrial corporations are organized and financed, stock and bond securities of all kinds find their level of value, money is transferred from one part of the world to another by foreign exchange bills; and fortunes are won and lost in stock speculations. Wall Street is a true barometer of the country's financial condition, reflecting depression and prosperity, if only one make due allowance for speculative flurries.

The stock exchange is the center of Wall Street. It is an unincorporated, voluntary association, with a membership of 1,100. The price of membership fluctuates. Nine thousand dollars was considered a very high price in 1879; but on two occasions (December, 1905, and August, 1906) a seat on the exchange has brought $95,000, the highest price yet paid.

Five hundred firms, besides individual brokers, transact the business of the exchange, buying and selling stock for themselves and for others. All transactions are completed through the stock-exchange's clearing-house, which receives and delivers bonds and stock certificates from 10 A.M. to 2:15 P.M. By this arrangement a broker can close up his day's business just as if it had all been transacted with one man. The arbitrage trade whereby the rate for exchange drafts is determined is carried on here between New York and such cities as London, Paris, Boston and Chicago. The banks do an enormous business in loaning money on sight and for short periods. There are 500 telephones on the floor of the exchange, each in charge of a boy who receives the orders of his office and transmits them to the floor-broker for execution.

Offices on Wall Street connect by private wire with all important cities east of Denver. A private wire from New York to Chicago costs $12,000 annually, but about 25 such wires are leased by the American Telephone and Telegraph Company between Wall Street and Chicago, 50 to Boston and 30 to Philadelphia. It is estimated that 300 representative commission-houses pay expense bills that aggregate $15,000,000 per year. Each concern employs from five to sixty men. The Consolidated Exchange, called "the Little Board," is a body of speculators who deal in small jobs by slyly getting the quotations from the Stock Exchange. They deal in ten-share lots instead of one hundred. It is safe to say, though no official record has been kept, that the

volume of business on the New York Stock Exchange has far exceeded that transacted by any other institution in the world.

Wal'nut, species of *Juglans*, and native of the temperate regions of the northern hemisphere. They are fine forest-trees, and also yield most valuable timber. The nuts of various species are well-known. The English walnut is *J. regia*, and is the common walnut of commerce. Its commercial culture in this country is practically confined to California, though it is grown in widely scattered portions of the country. Nut-culture in California has become a very important industry, walnut orchards a feature of the state. They are found along the coast and in the interior valleys. Hardy varieties are grown up into southern Oregon. Nuts are shaken from the trees, spread out in trays to dry, and bleached before shipping. Much damage has been done by a bacterial blight of the nut, in battling with which spraying with Bordeaux mixture is employed. The common black walnut of the United States is *J. nigra*, well known for its fine, dark timber as well as for its characteristic nuts. The tree is distributed generally in this country, but is not very common in the eastern states, being more familiar in rich lands of the Mississippi Basin. It is of slow growth, attains a height of 100 feet, and with its towering and great trunk presents a massive and splendid appearance. The bark is rough and blackish, foliage a light yellowish-green, from 13 to 23 leaflets growing on a stalk. The leaves come late and fall early, and the tree is further deprived of its foliage by the ravaging of countless fall web-worms. The round, black, sharply-furrowed nuts are of excellent flavor. They are encased in a greenish-yellow husk. The wood is heavy, strong and close-grained, and has been so greatly in demand for furniture, interior finish and gunstocks, that the tree is scarcely to be counted longer as a forest tree. The butternut or white walnut is *J. cinerea*, ranging from New England southward to Georgia and westward. It grows from 30 to 50 to 100 feet, has spreading horizontal branches; the bark is grayish, stalks sticky, leaflets oval, sessile. In the scarce foliage there is much of yellow. The wood is light brown, takes a high polish, and is used for furniture and interior finish. The rough, brown, oblong nut, pointed at one end, has a sweet, oily kernel.

Wal'pole, Horace, Earl of Orford, an English author, was born at London in 1717. He studied at Eton and Cambridge, traveled in Italy, and took his seat in Parliament in 1741, but never was active in public life. His home at Twickenham near London, called Strawberry Hill, adorned with vast collections of pictures, books, manuscripts, armor etc., was one of the sights of the time, and admittance was granted by ticket to parties of four from May to October. His writings include *Castle of Otranto, Memoirs of the Last Ten Years of the Reign of George II, Memoirs of the Reign of George III, Catalogue of Royal and Noble Authors, Historic Doubts on the Life and Reign of King Richard III, Anecdotes of Painting in England* and *Catalogue of Royal and Noble Authors of England.* But his fame rests upon his *Letters*, which are the product of years of acquaintance with public men and events, and entitle him to the rank of one of the best letter-writers in English literature. He died on March 2, 1797. See *Letters*, edited by Cunningham; *George Selwyn and His Contemporaries* by Jesse; and essay on *Letters of Horace Walpole* by Macaulay.

Walpole, Sir **Robert,** Earl of Orford, an English statesman, was born at Houghton in Norfolk, England, Aug. 26, 1676. He studied at Eton and Cambridge. Entering Parliament in 1701, he became secretary of war in 1707 and treasurer of the navy in 1709.. He defended the Whig party both with voice and pen, and his political enemies brought against him a charge of corruption, for which he was expelled from the house of commons and imprisoned in the Tower. With the accession of George I he became in succession privy councilor, chancellor of the exchequer and first lord of the treasury. Jealousy among the Whigs and the opposition of the German favorites of the king compelled Walpole's resignation in 1717, but in 1721 he was again called to power, and remained prime minister of England until 1742. His policy was to maintain peace abroad and quiet at home, and during his administration the country was very prosperous. The difficulties between King George II and the Prince of Wales led to his resignation, when he was made Earl of Orford. Charges of bribery were brought against him, but failed to be supported, though he doubless did not scruple to gain his ends by this means. He died in 1745. See Cox's *Life and Administration of Sir Robert Walpole.*

Walpur'gis Night is in Germany the night in which the witches and wizards hold their yearly gathering, the largest being the one held on the Brocken in the Harz Mountains. It originally was a vigil kept the night before May 1, in honor of St. Walpurgis, a sister of some early English missionaries to Germany, who established convents in that country, but it was changed with the belief in witchcraft to its present signification.

Walrus (*wŏl'rŭs*), a marine carnivorous mammal, closely related to seals and sea lions. It is known by its enormous down-turned tusks or canine teeth, projecting from the upper jaw, sometimes reaching a length of thirty inches, The tusks are of solid ivory; are useful in defense, an aid in

digging and in climbing. Old animals are almost naked, the young ones quite thickly covered with fur of a pale brown color.

Walruses have a thick, clumsy body, deepest at the shoulders, and their feet, which are adapted for swimming, are also

WALRUS

furrowed so as to hold on to smooth surfaces. They reach a length of 12 feet or more and a weight of 2,200 pounds. There are two living species, one found in the Atlantic and one in the Pacific. The Atlantic form is still found on the coast of Labrador and Hudson Bay, but formerly extended further south. The Pacific form is more northern, being rarely found on the mainland. They feed largely on clams and other mollusks, which they dig from the sea-bottom with their tusks. They visit islands and ice-floes, and congregate in considerable numbers during the breeding period. They are hunted for their hides, oil and ivory, and their flesh is relished by natives along the Arctic coast. Their decrease is a very serious loss to native Alaskan. The polar bear is the most dreaded natural enemy.

Walsall (*wŏl'sal*), a town in Staffordshire, England, eight miles northwest of Birmingham. Its churches and most of its public buildings are all modern. Harper's almshouses founded by James I, memorial cottages for 12 poor couples or widows and a cottage hospital are among its charities. It has a public library, town-hall, guildhall, theater and schools, including a grammar-school founded in 1554. Its situation in a region of extensive coal-mines and limestone quarries, with iron, stone and brick-clay near, makes it a manufacturing town, with iron and brass foundries. Locks, keys, bolts, pulleys and all kinds of ironware used in making carriages or harness are special manufactures. Walsall was fortified by Ethelfleda, daughter of Alfred the Great, held by William the Conqueror as a royal house, belonged to Richard Neville, Earl of Warwick (the king-maker), and was given by Henry VIII to the duke of Northumberland. Population 96,171.

Walsh, the Most Reverend John, born in Kilkenny, Ireland, 1830, died at Toronto, 1898; studied at St. John's College, Waterford, Ireland. Coming to Canada in 1852, he became a student at the Grand Seminary, Montreal. Ordained a priest in St. Michael's Cathedral, Toronto, in 1854 by Bishop Charbonnel. His first charge was that of Brock Mission, Lake Simcoe, in 1855. In 1857, in charge of the parish of St. Mary's, Toronto. Appointed to the rectorship of St. Michael's cathedral in 1859. In 1862 promoted and became vicar-general of the diocese. Visited Rome in 1864. Appointed Bishop of London (Western Canada), the see being transferred from Sandwich to that city in 1869. His work there was exceptionally successful. The debt of the diocese was paid off, and new churches, convents and an episcopal residence were erected. Visited Rome on two occasions later. On the second occasion, 1887, he assisted at the jubilee of Pope Leo XIII at St. Peter's. In 1889 he was appointed to the archbishopric of Toronto.

Walsingham (*wŏl'sĭng-ăm*), Sir **Francis,** an English statesman, was born at Chiselhurst, Kent, in 1536. He studied at Cambridge. He was distinguished among Queen Elizabeth's ministers for acuteness and for knowledge of public affairs. He was sent on an embassy to France in 1570, to the Netherlands in 1578, to France again in 1581 and to Scotland in 1583. He was secretary of state to Elizabeth, and managed foreign affairs by a system of spies, having it is said, had nearly 60 agents in his service. In this way he got possession of the correspondence of Mary, Queen of Scots, which was used to prove her guilty of conspiring against the life of Queen Elizabeth and he was one of the commissioners at her trial. He died on April 6, 1590.

Waltham (*wŏl'thăm*), **Mass.,** Middlesex County, on Charles River, ten miles northwest of Boston, is a suburb of that city. It has a Swedenborgian academy, a free public library, and numerous schools and churches. It is known all over the world for its machine-made watches, of which about 3,500 a day are turned out, making watch-tools, watch-dials and watch-screws. Clothing is an important industry, and automobiles are made to a considerable extent. There are also cotton cloth, hosiery, machinery, paper produced, and there are bleaching and dye works. It was settled in 1630. Population 26,842.

Walther von der Vogelweide (*väl'tĕr fŏn dĕr fō'gel-vī'dā*), (Walter of the Bird-Meadow), a German minstrel or *minnesinger*, was born in Tyrol, between 1160 and 1170. He was attached to the court of Duke Frederick of Austria, at Vienna, for many years, and at his death went from court to court after the fashion of the *minnesinger*. His early poems were love-songs, but the crusades and civil troubles of Germany furnished the subjects of his later verses. He stands in the front rank of the lyrical poets of his country. He died in 1228 or 1230 at Würzburg, where Frederick II had given him a valuable

estate. A monument was erected there to his memory in 1843, and a statue of him at Innsbruck in 1877. See MINNESINGER and LITERATURE (GERMAN.)

Walton (*wal'tŭn*), **Izaak,** a famous English author and "The Father of Angling," was born at Stafford, England, Aug. 9, 1593, and died at Winchester, England, Dec. 15, 1683. He was engaged in trade in London, as a linen-draper, between the years 1624 and 1644, and made a competence, upon which he retired and devoted himself to literary pursuits, and to angling, of which he became a renowned exponent. Besides his quaint and fascinating treatise on the rod — *The Complete Angler or the Contemplative Man's Recreation* (1653), he wrote a series of sketches of English divines, embraced in what is known, in their collective character, as Walton's *Lives*. These sketches dealt with Dr. John Donne, Richard Hooker ("the judicious Hooker"), George Herbert the poet and divine, Bishop Robert Sanderson and Sir Henry Wotten, the English diplomatist and author. Walton's *Lives* have deservedly found a place in the best literature and are sure of a long immortality. Considering the stormy era in which he lived, that of the great English Revolution (1642-60), waged by the Parliamentary army against Charles I and on to the Restoration, it is curious to note the serenity of mind and life of Master Izaak Walton.

Wampum (*wŏm'pŭm*), the name of Indian money, consisting of strings of shells and shell-beads, which were worn as ornaments. They were used mostly by the Algonquins, and were made on Long Island and around New York. The white wampum, called wampumpeag, was made from the conch-shell and the black or purple wampum or suckanhock from the hard-shell clam. The black was worth twice as much as the white. The beads were made by breaking the shells, rubbing the pieces smooth on a stone, and drilling holes in them so they could be strung. The French, Dutch and New England settlers made use of them, from four to six beads being worth a penny. A string was called a fathom, and was worth from five to ten shillings. A string of wampum was given with every article of a treaty, and a belt of wampum to bind the whole transaction. The belts were embroidered with colored beads, which formed a record of the event.

Wan'amaker, John, an American merchant, postmaster-general of the United States during 1889-93, and man of affairs, was born at Philadelphia, Pa., July 11, 1838, and was educated in the public schools of that city. In 1861, after removing for a time to Indiana, he set up in business for himself in his native city; and in 1876, after turning his establishment into a colossal department-store, with a separate house in New York City, he became the head of the firm — one of the largest concerns in the United States. In the conduct of these establishments he introduced the profit-sharing system among his employés, to their great pecuniary advantage; while his philanthropies manifested themselves in other directions, especially in the founding of Bethany Presbyterian Church and its organizations at Philadelphia and in presiding over the Young Men's Christian Association in that city. He also showed his great organizating and executive ability in the office of postmaster-general of the United States, to which he was appointed in 1889 by President Benjamin Harrison. During the Civil War he was one of the founders of the Christian Commission.

Wan'dering Jew, the name given to the hero of a popular legend. In one story he belonged to the tribe of Naphtali and went with the three wise men from the east to Bethlehem and his stories of the adoration of the infant were the cause of Herod's slaying the children of that region. As a carpenter, he was making the cross for Christ, when He passed on His way to Calvary, and refused Him rest. Christ bade him wander through the earth, without rest, till His second coming, which he has done ever since, seeking death in vain — so runs the legend. In another form of the story, he was a shoemaker at his bench, whereon he refused the Saviour permission to rest. The legend appeared first in the *Chronicle* of Matthew of Paris, and many poems and novels have been based on it, notably *The Wandering Jew* by Eugene Sue. It has also been the subject of illustrations, among the finest being those by Gustave Doré.

Wap'iti, a member of the stag, elk or deer family, once abounding over the American continent, but now met with only in the far west, among the foot-hills of the Rockies, and across the western boundary of the Canadian Dominion, where it has received its latinized name, *Cervus Canadensis*. It is a large animal, akin to the red deer of Europe, though standing higher, and with broad, spreading antlers, and frequently weighing 1,000 pounds. Formerly it largely furnished the Indians with food, together with ample hides for their lodge-tents, besides buck-skin clothing. It is a grazer rather than a browser.

War'bler, the name for any one of a family of small, abundant birds. There are two distinct families, the Old-World and the New-World warblers. The latter are the ones especially referred to here. There are about 100 species, all American. Many of them are less than five inches long, and nearly all are less than six and one half inches. They show great variation in colors and are difficult to identify. About 35 species regularly visit the northeastern

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GROUP OF WARBLERS

American Redstart. Magnolia Warbler. Bay Breasted Warbler.

states, but very few are familiar to the casual observer, for the reason that they perch mostly in the tree-tops, and must be especially looked for. They are all insect-eating and migratory, May and September being the months in which they are most abundant in the eastern United States, some arriving and others passing on their way north or south. The yellow warbler is a summer resident and is abundant in lawns, parks and orchards, but the others mostly inhabit woods. The redstart also is very abundant. It is a pert little bird, with red and black colors and a white belly. The black and white warbler nests in the eastern states. It runs over the bark of trees like a nuthatch. The black-throated, green warbler nests in pine woods from southern New England northward. Besides the tree-inhabiting warblers are a number which live in undergrowth and on the ground. Among these are the oven-bird and the Maryland yellow-throat. The former makes an oven-shaped nest of grass on the ground. It is one of the larger warblers, being about 6.15 inches long. The yellow-breasted chat is the largest of warblers, reaching a length of 7.45 inches. It is one of the few birds which sing regularly at night. The Old-World warblers are not represented in America. The tailor bird (*q. v.*), is an example.

Ward, Ar'temas, an American general, was born at Shrewsbury, Mass., Nov. 27, 1727. He was a graduate of Harvard College. He served in the French and Indian War and was sent as delegate to the provincial congress in 1774. He was commander of the Massachusetts troops at the beginning of the Revolutionary War and was head of the army until the appointment of Washington, when he was made second in command. He was placed first on the list of major-generals by Congress. He was 16 years in the Massachusetts legislature and a member of Congress for four years. He died at Shrewsbury, Mass., Oct. 28, 1800.

Ward, Artemus. See BROWNE, CHARLES FARRAR.

Ward, John Quincy Adams, an American sculptor, was born at Urbana, O., June 29, 1830. His first work was done in Washington, and consisted largely of busts of noted men, as Alexander Stephens, Hamlin etc. Since 1861 his home has been in New York. His *Indian Hunter*, *A Private of the Seventh Regiment* and *Shakespeare* are in Central Park, New York City; his colossal statue of Washington is on the steps of the subtreasury building in Wall Street, New York, and a statue of Henry Ward Beecher in Brooklyn, and that of William E. Dodge on Broadway, New York. The *Good Samaritan*, *The Freedman* and statues of *Commodore Perry*, *Washington* and *General Thomas* are others of his well-known works.

Ward, Mary Augusta Arnold (Mrs. Humphry Ward), English novelist, who has achieved a world-wide fame, was born in 1851 at Hobart, Tasmania, where her father, Thomas Arnold, M. A., son of Dr. Thomas Arnold of Rugby and brother of Matthew Arnold, held an educational appointment. "Like George Eliot, Mrs. Humphry Ward's contact with literature and life has been broad and fruitful." Her ability and scholarship were shown early in her literary career by her contributions to *Macmillan's Magazine*, by her articles in Smith's *Dictionary of Christian Biography* and by her translation of Amiel's *Journal Intime*. Her first venture in fiction was a tale of an actress's life — *Miss Bretherton* (1884). Four years later appeared *Robert Elsmere*, a remarkable though rather skeptical production, dealing with the struggle of an aspiring soul toward a newer theistic faith and creed. In 1892 came from her gifted pen *The History of David Grieve*, and two years subsequently appeared *Marcella*, the latter a noble study of woman's nature. Among other writings are *Sir George Tressady*, a sort of art sequel to *Marcella* and *Helbeck of Bannisdale*, two works of remarkable power and compelling interest. Mrs. Ward is intimately associated with the social and educational work of University Hall, an institution in London, now merged in Passmore Edwards' Settlement.

MRS. HUMPHRY WARD

Ware, Mass., a city in Hampshire County, on Ware River and the Boston and Albany and Boston and Maine, 22 miles west of Worcester and 25 northeast of Springfield. It occupies high ground, and besides cotton and woolen goods manufactures hosiery, paper, boots and shoes. It has an opera-house, public library and numerous churches and schools. It was incorporated in 1761. Population 8,700.

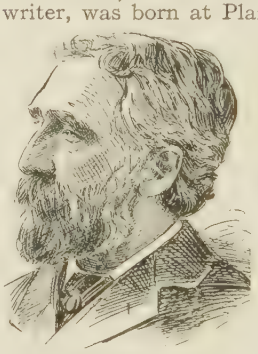
Waring (*wā'rĭng*), **George Edwin,** American sanitary engineer, was born at Poundridge N. Y., July 4, 1833, and died in New York City, Oct. 30, 1898. He was educated at Poughkeepsie, studied agriculture, and lectured on it in Maine and Vermont. From 1857 to 1861 he was drainage engineer of Central Park, New York; and on the outbreak of the Civil War he became major of the Garibaldi Guard, after which he raised and became major of the Fremont Hussars, and subsequently colonel of the 4th Missouri cavalry. In 1880 he became special agent of the United States 10th cen-

sus and, later, member of the national board of health. His knowledge of drainage problems made him very useful to the authorities of New York City and led to his being consulted by those of other towns and cities. After the yellow fever epidemic of 1878 in Memphis he devised the sewage system of that city, and from 1895 to 1898 he was commissioner of street cleaning in New York, doing wonders as administrative head of the department. In October, 1898, he was appointed head of a commission to improve the sanitary condition of Havana and other Cuban towns and to select the sites of camps for the American troops. His published works embrace *Draining for Profit and Draining for Health, How to Drain a House, Sewerage and Land Drainage* and *Sanitary Drainage of Houses and Farms.*

Warm'ing and Ven'tila'tion are so connected as to be best treated in one article. In one sense they are opposed to each other, as the necessity of ventilation or pure air requires frequent changes of the air, which thus carry off the heated air of a room and require more heat to replace it. The human body must be kept at a temperature of 98° for healthy living, which is secured partly by food, which supplies heat, and by clothing to retain the heat, but largely by artificial heat in houses. Pure air to breathe is also a necessity. The air we breathe contains oxygen and a small part of carbonic acid, which in large quantities is a poison. In breathing, the oxygen is taken from the air and carbonic acid is added to it, so that without a fresh supply the air of a room becomes in a short time so full of carbonic acid as to be poisonous. In warming and lighting a room the same process goes on — the oxygen is taken from the air and carbonic acid gas is given out. A person uses up the oxygen in four cubic feet of air every hour, and makes impure with carbonic acid one cubic foot of air every minute. A large oil-lamp will make impure 70 cubic feet of air an hour; a pound of coal in burning will use up 120 cubic feet of air; and a cubic foot of gas will rob ten feet of air of oxygen. Besides heating the fresh air let into a room for ventilation, the warming apparatus has to overcome the loss of heat through glass windows, walls, floors and ceilings.

The methods of warming and ventilating a room are numerous. The open fire, stoves and furnaces, supplying hot air, hot water or steam, are all in use and all have their advocates. The open fire gives the best ventilation, but is wasteful of coal and unequal in its heat. The close stove is economical of fuel and heats a room quickly, but burns the air, making it too dry for health. The use of furnaces has become quite general, especially for large buildings, as they heat every part of the house and at much less expense than would be necessary to heat the same space with stoves or grates. They burn the air, however, rendering it too dry, and need careful management. In order to prevent the escape of heat double walls, double windows and well-fitting doors are used, but the more successful these contrivances are, the less fresh air enters and the more need of artificial ventilation. If houses were perfectly built, the inmates would suffocate. Two things are necessary in ventilation: to remove foul air and to bring in pure air. As hot air rises, an open chimney in which the air is heated and drawn up, the cold air from the cracks and crevices taking its place, is always a ventilator, and in ordinary rooms, as houses are usually built, a sufficient one. Other methods in use are ventilating shafts, with openings at top or bottom or both, for the removal of the impure air and the introduction of fresh air; the heating of currents of fresh air introduced into stoves or furnaces and then distributed; and in large buildings pumping engines to force fresh air through pipes into all the rooms. The whole subject of warming and ventilation, however, is still a problem to builders. See Heating.

War'ner, Charles Dudley, an American writer, was born at Plainfield, Mass., Sept. 12, 1829. He was a graduate of Hamilton College, practiced surveying in Missouri, studied law in the University of Pennsylvania, and practiced in Chicago until 1860. He was editor of the *Press* and *Courant* at Hartford, Conn., and of a department in *Harper's Magazine.* Among his many writings are *My Winter on the Nile, A Round-about Journey, Their Pilgrimage, My Summer in a Garden, Baddeck and that Sort of Thing* and *Backlog Studies.* He also edited the series of *American Men of Letters* and *Library of Literature.* He died on Oct. 19, 1900.



CHARLES DUDLEY WARNER

Warner, Susan, an American author, was born at New York City in 1819. Her stories for girls have been very popular, especially the *Wide, Wide World,* which has had the largest circulation of any American novel except *Uncle Tom's Cabin.* Other writings are *Queechy, The Hills of the Shatemuc, The Old Helmet, Ellen Montgomery's Book-Shelf* etc. She was best known by her pen-name, of Elizabeth Wetherell; she died at Highland Falls, N. Y., March 17, 1885.

War'ren, O., county-seat of Trumbull County, on Mahoning River and the Pennsylvania, Erie and Baltimore and Ohio railroads, 52 miles southeast of Cleveland. Settled at the beginning of the 19th century, it was incorporated a generation later. It is situated in a good farming-region, through which electric tramways connect its chief towns. Its buildings include a public library, an hospital, opera-house, churches, schools and municipal offices. Its industries embrace a rolling-mill, tube-works, electrical apparatus and supply establishments, besides manufactories of automobiles, bath-tubs, stoves, ranges, tank-cars, shovels and fire-extinguishers. Population 10,071.

Warren, Pa., a borough, county-seat of Warren County, on the Alleghany River and on the Dunkirk, Alleghany Valley, Pennsylvania and Western New York railroads, 60 miles southeast of Erie. Besides a theater and a public library it has the state asylum for the insane. Settled about 1795, it was incorporated in 1832. Its industries embrace iron and steel works, machinery-works, oil-refineries, lumber-mills, furniture-factories and establishments for the manufacture of glue, barrels, wood-alcohol and pianos. Population 10,647.

Warren, Gouverneur Kemble, American soldier, was born at Cold Spring, N. Y., on Jan. 8, 1830. Studying for the army at West Point, he graduated in 1850, after which he acted as chief topographical engineer in the Sioux expedition of 1855. Returning to West Point, he for two years was assistant-professor of mathematics, but in 1861 accepted the lieutenant-colonelcy of the Fifth New York Volunteers, and took part in the battle of Big Bethel and was promoted to be brigadier-general for gallantry at Gaines' Mill. He subsequently distinguished himself at Malvern Hill, Manassas and Fredericksburg. In 1863 he acted as chief of topographical engineers under Hooker, and later as chief engineer in the Army of the Potomac. He also was at Gettysburg, and for his distinguished services there and in the field gained a brevet-colonelcy in the regular army and a step in rank, that of major-general of volunteers. Still later he took part in the battles of the Wilderness, and served professionally at the siege of Petersburg and in the Richmond campaign. In the battle of Five Forks he had some disagreement with General Sheridan, who relieved him of his command, though the result of a court of inquiry into the matter between them relieved Warren of personal blame. Reinstated, he was given command at Petersburg and was later in charge of the Department of the Mississippi. In 1865 he resigned his commission in the volunteers and was brevetted major-general in the regular army, and subsequently rendered approved service on surveys and in the improvement of harbors. He died at Newport, R. I., on Aug. 8, 1882.

Warren, Joseph, an American patriot, was born at Roxbury, Mass., June 11, 1741. He graduated at Harvard College, and began the practice of medicine at Boston. He twice delivered an address on anniversaries of the Boston Massacre. In 1774 he was president of the Massachusetts Congress, and was by it made a major-general. At the battle of Bunker Hill he appeared unattended, and, declining to take the command which was offered him, fought as a volunteer. As he was leaving the field, being one of the last to retire, his name was called by a British officer, who, commanding his men to stop firing, urged Warren to surrender. But as he turned his head at the sound of a voice, he was instantly killed by a ball striking him in the forehead, June 17, 1775. His statue at Bunker Hill was unveiled on June 17, 1857. See *Life* by Frothingham and that by Everett in Sparks' *American Biography.*

Warren, Samuel, an English novelist, was born in Wales in 1807, and died at London, July 29, 1877. He was a lawyer and edited an edition of Blackstone's *Commentaries;* but is best known by his novels, which appeared in *Blackwood's Magazine,* entitled *Ten Thousand a Year* and *Passages from the Diary of a Late Physician.* His other works are *Now and Then* and *The City and the Bee.*

Wark, Hon. David. Born near Londonderry, Ireland, in 1804, Came to New Brunswick, Canada, in 1825. Became a merchant. Elected to the New Brunswick Legislature in 1843. Appointed to the Legislative Council in 1851. Sat in the Council until the Union 1867. Appointed to the Senate at Federation. He wrote political pamphlets and was an active senator until within a few years of his decease. Called the Nestor of the Canadian Parliament. Died 1906.

War'saw, the former capital of Poland and the third city of the Russian Empire, is on the Vistula River, about 395 miles east of Berlin. It stands partly on a plain and partly on rising ground, and is connected with one of its beautiful suburbs by two fine bridges. There are about 160 palaces in Warsaw and 180 churches, among them the Cathedral of St. John, which dates from 1250; several theaters, one of them in a garden laid out in the old bed of the Vistula; fine squares and public gardens, with monuments to Sobieski, Copernicus etc. The university, founded in 1816 and closed by the Russians in 1832, was opened again in 1864. It has a library of 350,000 volumes, a fine observatory and 1,114 students. The leading industries of the place are plated silverware, musical instruments, carpets, boots and

shoes, carriages, woolen cloth and beer. Warsaw is first mentioned in history in 1224. It belonged to the dukes of Mazovia until 1526, when the land of the Mazurs was annexed to Poland. It was fought over continually by the Swedes, Russians, Brandenburgers and Austrians. In 1795 it was given to Prussia; in 1806 Napoleon's troops occupied it; in 1809 the Austrians; and the Russians finally obtained possession in 1813. Two unsuccessful rebellions against Russia occurred, one in 1834 and the last in 1863. The Russian government, determined to crush out utterly the spirit of independence, took severe measures, executing or banishing to Siberia the nobles and clergy and confiscating their property, carrying off in large bodies the tradesmen, closing the university, schools, monasteries and convents, and placing Russian officials in all places of power. The use of the Russian language was commanded, and even the name Poland was cut out of all legal documents. Population 756,426.

Wartburg (*värt'bōōrg*), an old German castle, near Eisenach, in Saxe-Weimar. The Wartburg War is the name given to a contest of the principal *minnesinger* of Germany, which was held at the castle about 1206. The castle also is the scene of the legend of St. Elizabeth of Hungary, who was the wife of one of the landgraves of Thuringia, to whom it belongs. It is best known, however, as the place where Luther was hid after the Diet of Worms and where he translated the Bible into German. In 1817 the German students celebrated here the three hundredth anniversary of the Reformation. The castle was built in 1070.

War'wick, Richard Neville, Earl of, called the king-maker, was born about 1420. He was a son of the earl of Salisbury, but through his wife obtained the estates and title of Earl of Warwick. In the Wars of the Roses he sided with the duke of York and won for him the battle of St. Albans, receiving in recompense the governorship of Calais and command of the English fleet for five years. At the battle of Towton, near York, the followers of Lancaster were gaining ground, when Warwick, riding up to Edward, duke of York, and getting down from his horse, which he shot in the head as a signal for an attack without retreat, said: "Sire, let him flee who will, but by this cross I will stand by him who will stand by me." The Yorkist party won, and Edward was crowned king in London, June 22, 1461. Edward's marriage with Elizabeth Woodville and that of his brother Clarence to Warwick's daughter made a breach between the two, which ended in the battle of Edgecote, where Edward was made a prisoner. After a partial reconciliation and another insurrection, Warwick openly deserted to the Lancastrian party under Queen Margaret, his son-in-law Clarence being promised the succession to the throne. Edward IV fled to Holland, and the imprisoned monarch Henry VI was restored, but only for a few months. Edward returned, with an army of 2,000 Englishmen; Clarence deserted Warwick and came to hs aid; Henry was again sent to the Tower; and at the battle of Barnet Warwick's forces were defeated and Warwick was slain (April 14, 1471). He lived royally, owning 100 manors, the city of Worcester and the Islands of Guernsey, Jersey, Alderney and Sark. At his house in London six oxen were usually eaten at a breakfast, and he daily fed 30,000 guests. He is called The Last of the Barons. See *Baronage of England* by Dugdale and *History of England* by Lingard.

Warwick, R. I., town in Kent County, on the Pawtucket and Providence Rivers and Cowsett and Narragansett Bays, five miles from Providence. The town is made up of several villages, each containing graded schools, and some have libraries. The chief manufactories are cotton mills, flour and grist mills, blacksmith and wheelwright shops, foundry and machine shops. Warwick was established in 1642 by a colony of Englishmen, and bore the name of Shawomet. In 1848 admirers of the Earl of Warwick changed the name. It has the distinction of being the birthplace of Nathanael Greene (*q.v.*). It is served by the New York, New Haven and Hartford Railroad. Population 25,464.

Wash'burne, Elihu Benjamin, an American statesman, was born at Livermore, Me., in 1816. He studied law and began his practice at Galena, Ill., in 1840. He was in Congress from 1852 to 1869, and was called the Father of the House for his long service. He was minister to France during the Franco-Prussian War, and at the request of Germany very skillfully protected Germans who were residing in France at the time. He wrote *Recollections of a Minister to France*. He belonged to a family of statesmen, two of his brothers being in Congress with him, and the governors of Wisconsin and Maine, and another brother was United States minister at Paraguay. Elihu Washburne died at Chicago, where he spent the last years of his life, Oct. 22, 1887.

Wash'ington, the extreme northwestern state of the Union, abutting on the Pacific. The Columbia River, in the main, marks its southern boundary and separates it from Oregon. Its boundary on the west is the Pacific, on the east Idaho and on the north British Columbia, the Strait of Juan de Fuca separating it from Vancouver Island, a part of British Columbia. The Cascade Mountains traverse the state from north to south and extend southward into Oregon. The area of the state is 69,180 square miles,

its length being 230 miles and its extreme breadth 340. The population in 1908 was nearly 1,000,000. Its capital is Olympia. The larger cities are Seattle (population 200,000), Tacoma (95,000), Spokane (85,000) and Walla Walla (18,000).

Surface and Climate. The Cascade Mountains' lofty peaks are striking features. They embrace Mount Baker (10,827 feet), Glacier Peak (10,436) and, farther south, Mt. Rainier or Tacoma (14,363), Mt. Adams (12,470) and Mt. St. Helens (10,000). In the northeast, between Puget Sound and the Pacific, is the coastal range known as the Olympic Mountains, the highest peak of which is Mt. Olympus. In the southeast are the Blue Mountains, while in the northeast there are several ranges of the Rockies. Bordering on the Chelan range is oblong-shaped Chelan Lake; west of the range and extending southward from the Strait of Juan de Fuca is the extensive basin of Puget Sound, with its variedly ramifying arms. Besides the Columbia the chief rivers are the Snake, its most important tributary, entering it from the east, the Okanagan, the Yakima, the Pend' Oreille, the Spokane, the Chehalis, Skagit, Nesqually and other streams. The coastal inlets, besides that of the Columbia River and Puget Sound, are Gray's and Wallapi Harbors. The climate varies greatly, the region west of the Cascade Range being much more humid and, on the whole, warmer and more equable under the tempering influence of the ocean; while in the east the rainfall is barely normal and less favorable for agriculture, and the soil for the most part is infertile, with underlying rock and lava-covered surface. The east, moreover, is treeless in parts, though there is much yellow and white pine, while the west has magnificent forests, in which occur gigantic conifers, cedar, spruce and hemlock.

Natural Resources. The lumber industry leads all others in the annual value of its products. In 1900 the number of establishments turning out timber and planing-mill products was close upon 800, with an output valued at over 30 million dollars, while the number of wage-earners engaged in the trade exceeded 15,000. To conserve and promote the industry, the Federal government has established five forest reserves aggregating over seven million acres. Agriculture also does well, despite the large mountainous areas. Of the yield from the cereals wheat has by far the best showing; the yield in 1907 was 35,045,000 bushels, while the product of oats was 10,545,000 bushels. The barley and the hay crop are also large, while fruit-culture, especially apples, plums and prunes, is a profitable and growing industry. Stock-raising is an important industry. In 1907 the state had 824,129 sheep, 409,050 cattle, besides 173,724 dairy-cows, 296,400 horses and 172,178 swine. The fisheries also are an important industry, the amount invested in the trade in 1905 being over seven and a half millions. The annual catch of salmon is especially large, and the fish-canning industry is very important. Coal yields largely, the output in 1906, including lignite as well as bituminous coking-coal, being 3,293,098 short tons. Of quarried building-stone, embracing granite and limestone, as well as the clay products of brick and tile, the state had $2,238,536 in value. Gold, silver, copper, iron and lead also are among its products.

Manufactures. With the advantages the state has in coal, extensive water-power and good facilities of transportation, Washington's growth in manufacturing industries is to be looked for. Already it has nearly 100 million dollars invested in manufactures, while the value of the products of all kinds in 1905 was close upon 130 millions. The number of wage-earners was 45,199, wages amounting to fully 30 million dollars. Among the chief manufactures are those of the timber and lumber mills, of flour and grist mills and of fishing, curing and canning establishments. Fish-canning nets annually close upon five million dollars, while the flour and grist mill receipts in 1905 were nearly seven million. Besides, there are the factory product in cheese, butter and condensed milk and the product of the slaughter-houses and meat-packing establishments.

Commerce and Transportation. With such facilities in the furthering of oceanic trade from the Puget-Sound ports of Seattle and Port Townsend, as well as from those in the Columbia River, commerce is bound steadily and largely to increase. Already Washington has a large oriental and Pacific trade from Seattle and Port Townsend. The railway mileage in 1906 was 3,313 miles, the chief lines being the Northern Pacific and the Great Northern, while it is connected at Seattle with the Canadian Pacific. There are five other railroads, and the Milwaukee, North Coast and Union Pacific railroads are building into the state. Large steamers reach Vancouver on the Columbia, while there is a large inland navigation, of smaller steamers, on that river, as also on Snake River. The assessed valuation of the state had in 1905 grown to nearly 310 millions.

Education. The public schools are under a board of education, with a state superintendent of public instruction. The schools' population in 1905 exceeded 207,000, the enrollment being 170,000 and the daily average attendance about 120,000. The teachers numbered about 5,250, four fifths of whom were women; and the total expenditure for school maintenance amounted to over four and one third million dollars.

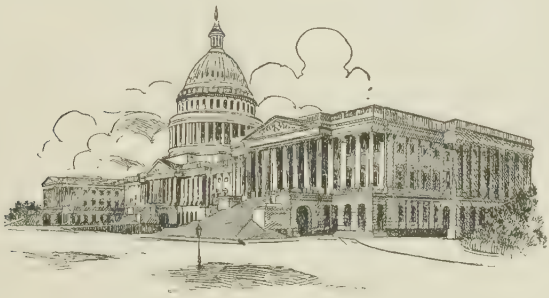
Agricultural colleges are maintained by the state at Pullman and Seattle, and at the latter is the University of Washington, with 74 instructors and 1,394 students. The other higher seats of learning are Whitman College (undenominational) at Walla Walla, with 35 instructors and 425 students; Whitworth College (Presbyterian), Tacoma, with 21 instructors and 215 students; the University of Puget Sound (M. E.) at Tacoma; and Gonzaga (R. C.) College at Spokane. State normal schools are in operation at Cheney and Ellensbury; at Chehalis there is a reform school; at Vancouver a school for defective youth; at Orting a soldier's home; and at Walla Walla a state penitentiary.

History and Government. The early history of the region is marked first by conflicts between Spain and Great Britain and later by difficulties between England and the United States. These disputes occurred as the result of early exploration and the successive operations of the fur-traders. As far back as the 16th century the Oregon region was visited by Sir Francis Drake, while a Greek mariner in the Spanish service is credited with having discovered and named the Strait of Juan de Fuca. Captain Gray of Boston discovered and entered Columbia River in 1792. George Vancouver, the English navigator who gave his name to Vancouver Island and Vancouver City, was another explorer of the region about 1791–2. He was preceded by Captain Cook, who in 1778 discovered Nootka Sound, the deep inlet in Vancouver Island; while at the close of the 18th century Captain Vancouver penetrated Puget Sound and disclosed its ramification of bays and harbors. Later came the fur-traders, and among them Jacob Astor, who in 1811 founded Astoria on the southern bank of the Columbia near its outlet. This post was captured in the War of 1812 by the British and renamed Fort George, though five years later it was restored and supplanted by Fort Vancouver, founded in 1824–5. In 1804–6 the Lewis and Clark expedition explored the region, and upon this expedition and its explorations, together with the purchase from France of the Louisiana Territory as well as upon Gray's discovery, rests the American claim to the region, including the great waterway of the Columbia. Settlement at first progressed slowly, immigration not coming until the thirties, when Walla Walla was founded, followed ten years later by settlement about Puget Sound. About this period Oregon organized a territorial government which included Washington and part of Idaho; but in 1853 Washington was formed into a territory with a government of its own; this continued till 1889, when the territory was admitted as a state. Before 1840 boundary differences became acute on several occasions, increased by the clamor of gold-seekers who sought to know to which nation — Britain or the United States — they owed allegiance. The matter was a vexatious one, as both countries from 1827–8 had jointly occupied the region, the British seeking ownership as far south as the mouth of the Columbia and Russia agreeing not to encroach southward below 54° 40′. About 1844 the difficulty almost precipitated war between England and the United States, for the Democratic rallying-cry of the era was "Fifty-four forty, or fight!" In 1846 the boundary agreed upon by the Webster-Ashburton treaty was 49° N., the separating line being the channel between Washington and Vancouver Island. This settlement, as it turned out, was vague, for in 1859 the question arose as to whether the channel gave the United States possession of Haro Archipelago and San Juan Island. The contention being submitted for arbitration to Germany, its emperor in 1872 decided in favor of the United States. In 1885–6 there was trouble with the Chinese entering the state, the governor being obliged to call Federal troops to his aid in quelling disturbances at Seattle. Thirty years prior to that the state had to contend against the Indians who troubled both Washington Territory and Oregon. Consult Hawthorne's *Washington;* Irving's *Astoria;* Squires' *Resources and Development of Washington;* and Bancroft's *Washington, Idaho and Montana.*

Washington, D. C., the capital of the United States, is in the District of Columbia on the Potomac River, 39 miles southwest of Baltimore. The city was laid out under the direction of Washington, on a plain 40 feet above the river, with wide streets and 21 broad avenues, named after the states. Three streets, known as North, South and East Capitol Streets, radiate from the Capitol, and with a line of public parks divide the city into four quarters. The avenues run diagonally, and where they cross circles are formed, with triangles at their intersection with the streets, and besides these ornamental spaces there are a number of squares with trees, shrubbery, fountains and statues. Pennsylvania Avenue is the main street of the city, and Massachusetts Avenue the finest.

The chief public building is the Capitol, of which the corner-stone was laid by Washington in 1793, and the structure finished in 1827. An extension of two wings was finished in 1867. The building covers about 3½ acres, and is 751 feet long and 348 feet broad. The dome, 287½ feet high, is crowned by a bronze statue of Liberty. The rotunda under the dome, senate chamber, hall for the house of representatives and one for the supreme court are some of the interior rooms. The White House, the residence of

the president of the United States, is a mile and a half from the Capitol. It was first used by President Adams in 1800. The other public buildings are the treasury, state, war, navy, interior and post-office departments, pension building, Smithsonian Institute, observatory, arsenal and the new Congressional Library building, in modified Italian-renaissance style, which has a capacity for 4,500,000 volumes and is one of the finest of all the capital buildings. The National Deaf-Mute College, the only one in the world, Howard University, Columbian University and the Catholic University are among the educational in-



THE CAPITOL

stitutions. The government hospital for the insane, naval hospital, soldiers' home and Columbian Institution for the deaf and dumb are a part of its charities. The Corcoran Art Gallery contains one of the finest collections in America. The Washington monument, 555 feet above the foundations, the highest in the world; the Lafayette monument, naval monument, Abraham Lincoln with the proclamation of emancipation, a statue of Jackson, made from the cannon captured at New Orleans, and one of Scott, from cannon taken in the Mexican War; and statues of Washington, Garfield, Greene, Marshall, Dupont, Farragut, Franklin, Luther and Marquette are some of the best known of the monuments of the city. The site of Washington was selected by General Washington in 1791, and Congress met there for the first time on Nov. 17, 1800. In 1814 it was occupied by the British and the public buildings burned. Though several times threatened during the Civil War, it was never attacked. Since 1871 the city has been improved at great expense, making it now one of the most beautiful cities in the world. Population estimated at 330,000. See DISTRICT OF COLUMBIA and articles under titles as above.

Washington, Ind., a city, the seat of Daviess County, on the Baltimore and Ohio Southwestern and Evansville and Terre Haute railroads, 20 miles east of Vincennes and 86 southwest of Indianapolis. It has a fine farming and stock-raising country tributary to it, and produces large quantities of bituminous and cannel coal. It is a shipping-point for grain, cattle, flour, coal, fire-clay, brick and tiling etc. It has a public library, several banks, daily and weekly newspapers, besides schools and churches Population 8,551.

Washington, Pa., a city 30 miles southwest of Pittsburg, is in the center of valuable fields of gas, coal and oil. It has carriage and glass factories, and also makes brick. This city is the seat of Washington and Jefferson College, Trinity Hall Academy and Washington Ladies Seminary. The college was formed in 1865 by the union of Washington College, which as an academy dated back to 1787, and Jefferson College, which grew out of Canonsburg Academy, opened in 1791. Population 17,000.

Washington, Book'er Taliaferro, principal of Tuskegee Normal and Industrial Institute, Tuskegee, Ala., was born in Franklin County, Va., about 1859. Born a slave, he has become prominent as a speaker and writer on racial and on educational topics. Early in life he worked in salt-mines in Malden, W. Va., but managed to make his way to Hampton Institute, Virginia, where he received an education. In 1881 he was called to Tuskegee Institute, founded by him in the interests of the colored race, which he seeks to elevate by means not only of religious instruction but by an academic training, coupled with courses in manual and industrial work of a useful and practical character. Over 1,000 students annually attend the institute and find their way afterwards into industrial occupations. The institution is nondenominational and is for both sexes, the founder's idea being to enable his colored brethren to meet present-day conditions, social and industrial, in the south and to do that by suitable education and moral training in the students he turns out from his college.

Washington, George, is the other American hero whose fame is not wholly accounted for by the record of his life. Like Lincoln the man was infinitely greater than anything he did. A military genius, he wrested liberty from tyranny; a statesman, he helped evolve a stable government from political chaos; a patriot, he refused a crown. Wisdom, patience, tolerance, courage, consecration to the righteous cause animated his every act; ingratitude, injustice and treachery never embittered him but served to strengthen his character. He grew in dignity and in capacity to the need of his growing responsibility and power, but he never became arrogant; and ambition and opportunity never tempted him from the narrow path of honor. Yet, after we have

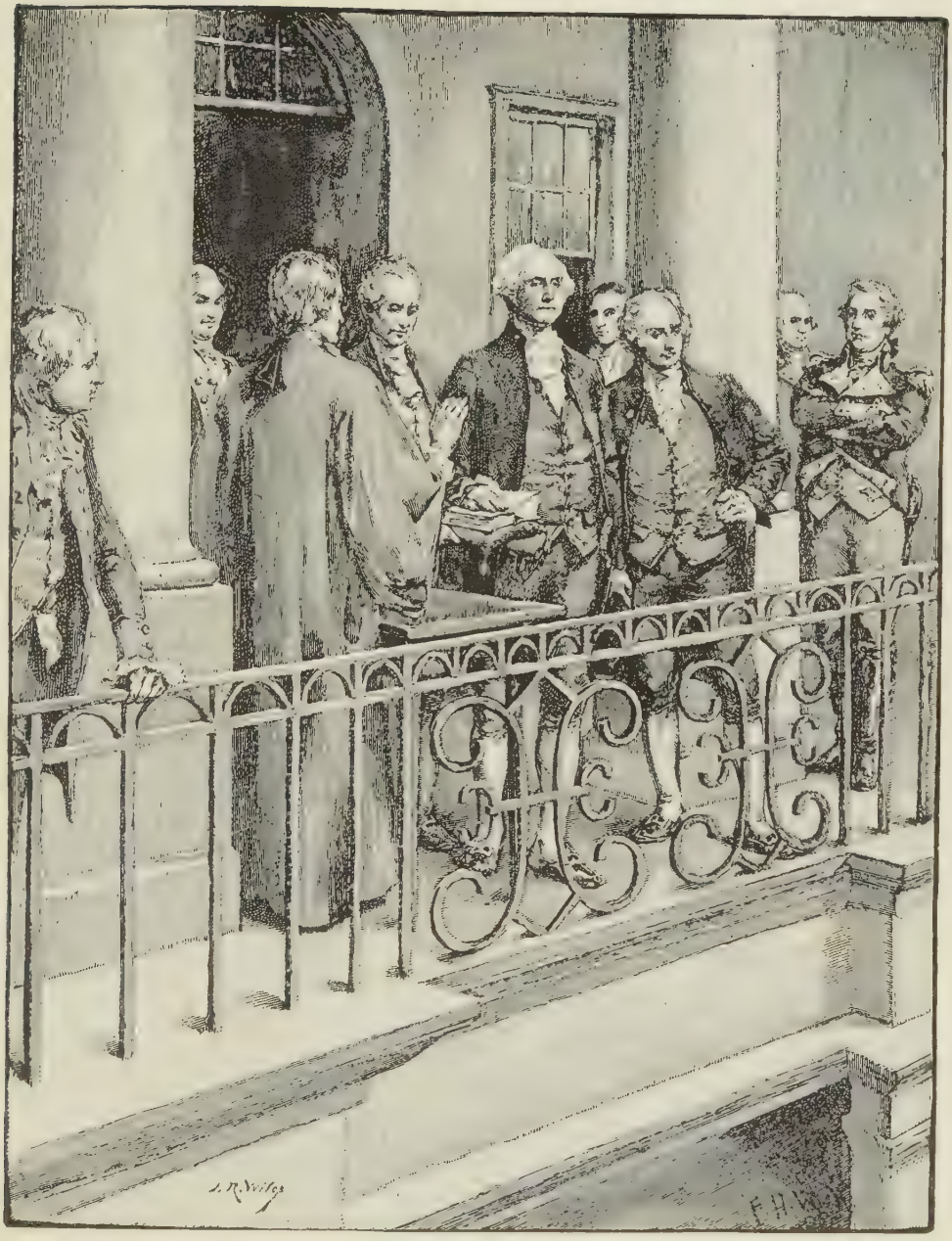
reminded ourselves of all his lofty virtues and his incomparable services, we have still not expressed the feeling we have for his memory. We are continually admon ished to shape our lives and our conduct by the model he has established for us; and to think less of the reward, more of the duty well-done.

The first president of the United States was of the fourth generation of the Washington family in America. His great-grandfather, John Washington, came over from Yorkshire, England, in 1657. That he was a man of education, property and good birth is proven by the fact that he took up a large tract of land in Westmoreland County, on the Potomac, laid out a tobacco-plantation, acquired slaves, became a magistrate and a member of the Virginia House of Burgesses. This property was still in the family when George Washington was born, February 22, 1732, three quarters of a century later. He was the oldest of the five children of Augustine and Mary Ball Washington. He had, however, two older half-brothers. The oldest, Augustine, seems to have taken over the estate on the Potomac, and Lawrence to have acquired the Mt. Vernon property through his marriage with a Miss Fairfax. With his second wife and younger children the father removed to a plantation on the Rappahannock, near Fredericksburg. It was here that Washington grew up, under the care of his mother, for his father died when he was under 11. He learned to read, write and cipher in a school kept by the sexton of the parish church, and, later, had private tutoring in geometry and surveying. It was to his wise, lovely, devoted mother that he owed his moral and religious training. Her favorite book was Sir Matthew Hale's *Contemplations*. It was filled with precepts and maxims, easily memorized and easily applied to daily conduct. From these Washington early compiled his maxims. When he died, his mother's book was found carefully preserved in the library at Mount Vernon.

GEORGE WASHINGTON

As was the unjust custom of that time, very little provision was made for the younger children. Washington, Jefferson and Franklin, in forming our government, saw that this law of entail by which the oldest son inherited the estate, was broken. Washington's older half-brother Lawrence, who was rich and influential, did everything he could to further his promising brother's fortunes. A warrant as midshipman in the king's navy was secured for him, but his mother refused her consent for him to go to sea. He then fitted himself for an appointment as surveyor of Lord Fairfax's enormous grant of Virginian land. At 16 he began this work, making his home ever after at Mount Vernon. The traits of character he had displayed in school and among his playmates now came out prominently. In the schoolboys' soldier-plays he had always been chosen captain because of natural ability to direct others. In games of skill he was the umpire for his fairness. He excelled in running, wrestling and horseback-riding. His school-papers were models of neatness and accuracy. Now he had to live afoot and on horseback in the wilderness; he had helpers to direct, inferiors to govern; and he had to make out survey-records so complete and accurate that they would be accepted by public officials upon which to base titles to land. When he returned from three years of hardships and danger and exacting work in mountain and forest, he was a handsome youth of 19. He had his full height of six feet two inches. Slender at that time, he added weight with the years. In his later life his appearance was one of the greatest dignity and nobility. He had blue eyes, an abundance of brown hair and a clear, ruddy complexion. His manner was self-controlled, his speech well-considered. Even as a stripling he was considered a man of such remarkable gifts and experience that at 21 he was made major of the Virginian militia at a time when the colonies were preparing for war with France, and was entrusted with a message to a French post, 600 miles distant, by Governor Dinwiddie.

That journey was a severe test of character and capacity. It took him across unexplored mountains, through trackless forests infested with wild beasts and hostile savages. A treachercus Indian guide attempted to assassinate him. He narrowly escaped drowning when crossing the flooded Alleghany on a rude raft. He was looked upon as the rising hope of the colony, and in the French and Indian War he was made an aid-de-camp to General Braddock. His advice as to methods employed by the Indians in border warfare was ignored, and Braddock suffered a terrible defeat. Washington was the only mounted officer in the engagement who was not killed. Two horses were shot from under him and he had four bullet holes in his coat, but he escaped unhurt. He wrote to his mother that he felt he had been preserved by Providence for some great duty. The Indians believed he bore a charmed life. In 1758 he carried the British colors into the smoking ruins of Ft. Duquesne, and helped rebuild it as Ft. Pitt (now Pittsburgh). When, at the end of the war, the speaker of the Virginian House of Burgesses formally thanked him for his military services he was too confused



Baron Steuben Gov. Arthur St. Clair Secretary Samuel A. Otis Roger Sherman Gov. George Clinton
Chancellor Robert R. Livingston George Washington John Adams Gen'l Henry Knox

WASHINGTON TAKING THE OATH AS PRESIDENT

APRIL 30, 1789, ON THE SITE OF THE PRESENT TREASURY BUILDING, WALL STREET, NEW YORK CITY

to speak. "Sit down, Col. Washington," said the speaker; "your modesty equals your valor and that is beyond praise."

Thus in 1758 the period of his youth came to a close. He had inherited the estate of Mt. Vernon on the death of his brother Lawrence, and he soon afterwards married a charming and wealthy young widow, Mrs. Martha Dandridge Custis. He never had any children of his own, but to hers he was devoted. The education of the Custis children; the care of his large estate and numerous slaves; his office as vestryman in the parish church; his social pleasures and his duties as a member of the House of Burgesses, which met twice a year in Williamsburg, occupied his time most agreeably for the next 15 years. In accepting the call to public duty he gave up a very beautiful, complete and endearing domestic life for which no honors ever compensated.

In 1774 he was chosen a delegate to the first Continental Congress. Many remarkable men were there — Franklin and Jefferson and others — but Patrick Henry said: "In solid information and sound judgment Washington was the greatest man on the floor." It was Massachusetts, where the battle of Lexington was fought in April, 1775, that insisted a month later on the supreme command of the army being given to the Virginian colonel. When the appointment was offered to him, he replied that he was deeply honored, but honestly felt that he lacked capacity for so great a task. He refused pay for his services. He arrived in Boston late in June, after the battle of Bunker Hill. Beginning with an army of 17,000 untrained men, with few supplies, he had to attend, not only to his military duties, but to serve 14 masters — Congress and the 13 colonies — and to persuade all of them to support his operations and furnish men and supplies. It was an experience to make a great man, to break a weak one. When, in March of 1776, the British were driven out of Boston, Washington had become a statesman and a military commander of the first rank.

Washington's fame as one of "the greatest generals of history," as Frederick the Great called him, does not rest on the battles he fought. The greatest battle of the Revolution — probably the decisive conflict that turned the tide of war — was the battle of Saratoga when Burgoyne surrendered. Washington's retreat across New Jersey; the manner in which he turned and struck the pursuing enemy at Trenton and Princeton and then established himself on the heights of Morristown, overlooking New York; and the vigorous resistance to British occupation of Philadelphia at Chad's Ford and Germantown all marked him as a consummate military genius. That record was crowned by the terrible winter of 1777-8 at Valley Forge. In spite of the misery of his soldiers, the clamor of the people tired of war, the delays of a fugitive Congress and the scheme to have him superseded by General Gates, he held his strategic position, and held his starving, freezing army to its task. When, on the news of the French alliance, Philadelphia was evacuated to unite the two British armies in New York, Washington chased the enemy across New Jersey and shut them into New York. There he remained, watching, waiting, on the Hudson, while the British carried the war to the south. They captured Savannah and Charleston and entrenched at Yorktown, Virginia. Then, feigning an attack on the weak garrison in New York, he made a forced march to the Potomac, the French fleet appearing simultaneously in Chesapeake Bay. Three weeks later Cornwallis surrendered and the seven years' war was over.

In 1783 Washington returned to Mount Vernon, — he hoped to private life. But that was not to be. His canonization had already begun. The Revolution had brought forward a score of able, patriotic men, but in the six years' struggle to frame a constitution and establish a federal government Washington was the court of last appeal, his the deciding voice. "The office of president was cut to Washington's measure" is said by one historian. No one else was thought of. He was chosen unanimously in 1789 and again in 1793. A third term he refused, and thus established a precedent which no political party has since dared disregard. For eight years, and until the government was firmly established, he prevented the formation of political parties by Hamilton and Jefferson, allying himself with neither but keeping both in his cabinet. Two years after his retirement he died at Mount Vernon on Dec. 14, 1799. Chief-Justice John Marshall, in moving the resolution of national grief in Congress, uttered the immortal words: "First in war, first in peace and first in the hearts of his countrymen."

His place is not less to-day because he shares it with Lincoln — one the creator, the other the savior, of our country. We touch Lincoln at more points of human understanding and sympathy. He remains a warm personality. Washington's image tended once to grow remote and legendary. But we love and revere them equally. The final word as to Washington was said by John Richard Green, the historian of the English people, when he characterized Washington as "the noblest figure that ever stood in the forefront of a nation's life." Tennyson's word as to Wellington applies even more to Washington: "Whatever record leap to light, *he* never shall be shamed."

There are numerous biographies of Washington. Irving's *Life* is marked by its literary quality. Weems' *Life* was the earliest, and was the one possessed by Lincoln when he was

a boy. Lodge's *Washington* in the American Statesmen Series is exceptionally helpful.

Washington and Jefferson College, at Washington, Penn., originated as Jefferson College (1802) and Washington College (1806), the two uniting in 1865 as Washington and Jefferson College. Thirty-one trustees control it, and are a self-perpetuating board. There are classical, engineering, French-scientific and Latin-scientific courses. The studies of the first two years of the classical, French and Latin courses differ, but in the last two years of each of these courses there are the same electives and the same required studies. The college possesses a preparatory department, and numbers 30 professors, 425 students and 20,000 volumes in its library. In 1907 its productive funds were $508,258 and its income $50,302.

Washington and Lee Univer'sity, located at Lexington, Va., was chartered in 1782 as Liberty Hall Academy. The first important gift of property to the school was made by George Washington in 1796. In recognition of this benefaction the name of the school was changed to Washington Academy, which later became Washington College. At the close of the Civil War Gen. Robert E. Lee was elected president of the college, and was installed on Oct. 2, 1865. This position he held until his death, Oct. 12, 1870. In 1871 the general assembly of Virginia changed the name of the institution to Washington and Lee University. It now has a faculty of 31, with 400 students in attendance.

Washington Elm. This is an ancient tree at the northwest of the Common, in Cambridge, Mass. Here Washington is reported to have stood when on July 3, 1775, he took the command of the American forces in the war of the Revolution.

Wasp (*wŏsp*), any one of a considerable group of insects, forming, with bees and ants, the highest order of insects (*Hymenoptera*). These well-known insects show some variation in form. Sometimes the thorax and abdomen are connected by a slender thread; but in other forms these parts of the body merge into one another. The social wasps, like the hornet or yellow jacket, are the best known. They build nests of paper attached to bushes, trees, roofs and eaves of buildings; or near the ground; or sometimes under stumps and stones. The paper is manufactured from wood-fiber obtained from posts and unpainted boards. This is chewed in the jaws and united into sheets, often of considerable extent. The nests are often top-shaped or balloon-shaped, with layers of cells inside resembling honeycomb, all inclosed in a spherical envelop of paper with a hole at the bottom for entrance and exit. The cells are hexagonal and in a single layer. In each cell one egg is placed; the larvæ, on emerging, hang head downward. The nests in tropical countries sometimes are six feet long. The species of social wasps that make nests in the ground form a more fragile sort of paper from decayed wood. The colonies include three forms: males, females and workers. The males and workers die on the arrival of cold weather, but the females live over the winter in sheltered places, and start a new colony in the spring. The workers only have stings. The solitary wasps include miners, mud-daubers and carpenters. The mason-wasps or mud-daubers are the most familiar, as their mud nests are commonly seen on beams and walls. The carpenters cut tubular nests in wood and divide them by mud partitions. The miners dig tunnels in the earth. Young wasps as a rule are fed largely on insects, though fruit and flower juices are included in their diet. Caterpillars, other larvæ, grubs and spiders are stored away for future use. In all their work and habits wasps are of much interest. Consult Lubbock's *Ants, Bees and Wasps* and Howard's *The Insect-Book*. See HORNETS.

Wat Ty'ler, the leader of a rebellion in England in the reign of Richard II. A poll-tax was levied on every one over 15 years of age, which was very odious to the people. When Walter the Tiler killed a taxgatherer who had insulted his daughter, the people were ready to rally around him. The insurgents numbered 100,000 by the time they had reached London, where they took possession of the Tower and put to death the Archbishop of Canterbury and others. The first demands of the rebels were granted, but Tyler grew insolent and was killed by the mayor of London (June 15, 1381). Richard II, in his 16th year, took command of the rebels, and succeeded in leading them back to their homes, but when they were once scattered the promises made to them were not kept, and many of them were severely punished.

Watch. See CLOCK.

Watch'making. With the invention of coiled springs as the source of power in time-pieces, it became possible to make them small enough to put in the pocket. Now that clocks also are made with springs, the difference between them and watches is simply a matter of size. The first watches were made, it is said, in Nuremberg about 1500, and on account of their shape and size were called Nuremberg eggs. The early watches were made in many curious shapes, and indeed, before the modern day of hurry and necessity for promptitude, they were of little use. To overcome the variations in power as the spring uncoiled, the fusee and chain were used, the fusee being the axle on which the chain was coiled. Watches were not exact, and had only an hour-hand till Hooke in 1658 invented the balance-wheel, including the hair-spring. It is used to

take the place of a pendulum, which of course can not be used in a watch. The next step was the invention of the lever escapement about 1770, which applies the regulation of the balance-wheel with much more accuracy than had been attainable. The fifth important step was the invention of the compensating balance. Watches are more affected by changes in temperature than are clocks, and it was necessary so to arrange different metals in the balance that the contraction or expansion of one would offset that of the other. This invention (1764) made possible the exactness of the chronometer, which in turn enables sailors to tell their longitude with precision. Perhaps the invention of stem-winding and stem-setting to take the place of the key so easily lost deserves the sixth place. The latest development is the application of machinery to the manufacture of watches, and this was brought about by American ingenuity about 1854, when the celebrated factories at Waltham (*q.v.*) were established. Not only does machinery make the parts more exactly than hand-labor, but this exactness makes it possible to dispense with the fusee and chain. The American watch has about 153 parts to the 800 parts that had to be brought together in the British or the Swiss watch. Improved methods of hardening steel made jewel-bearings less important, and so the way was prepared for the "dollar watch." Before machinery was applied, the parts of any one watch had to be specially made for it; but now the parts of a watch never face each other till they are ready to go into the case together. Being made of standard sizes, they always fit. Watch manufactories are now scattered over the north of the United States, but the chief centers are in Massachusetts, Connecticut, New York and Illinois. England and Switzerland make the better, Germany the cheaper, watches.

Wa'ter (H_2O) is a clear, transparent liquid, formed of oxygen and hydrogen. It is almost colorless, though in large masses it looks blue. It freezes at 32°F. and boils at 212°F., and passes off in steam. Water dissolves almost everything it comes in contact with, so that strictly pure water is never found. Rain-water is the purest form, but even that has absorbed air and ammonia. Water is found very widely distributed in nature in the form of ice and snow, in watery vapor in the air, in lakes, rivers and seas, in the soil and rocks, in the sap and juices of plants and in the blood and flesh of animals. It covers three fourths of the surface of the earth, and forms a large part of the bodies of animals. The ocean is nature's great reservoir or cistern, and from it all other water may be said to be taken. A constant stream of vapor passes into the atmosphere and is condensed in colder regions, returning to the earth in the form of rain, dew, frost and snow, which fertilize the earth, are collected into pools, springs, lakes and rivers, and finally find their way back to the ocean. These waters all take up various substances, as is seen by the color of different rivers, which varies as the soil through which they pass. The water of the ocean is salt, but the saline or salty matter does not form a vapor, and so is left behind when the watery vapor rises from its surface. Besides its use in watering the earth and in feeding animal and vegetable life, water has been the great agent in forming the surface of the earth. A river carries with it a large amount of earthy matter, of which it has robbed the hills in which it springs, and deposits it in the valleys through which it flows; the great bars and deltas at the mouths of rivers being examples of the amount of land sometimes formed by the sediment in a river. This double process of breaking down and dissolving the rocks and of depositing and building up the land is constantly going on, and has been going on for ages. Geology gives the results of this constant action of water in past ages, as seen in the strata or layers of rocks which form the earth. In the form of ice or glaciers water has also had a large part to play in forming the continents. Some of the many purposes it serves are its use in supplying a motive-power to machinery, either mechanically, as in waterfalls, or by its expansion into steam, its use in cleansing and cooking or domestic purposes, its use in the laboratory as a solvent or dissolver of most substances and its universal use by men, animals and plants for drinking purposes. Consult Tyndall's *Forms of Water*. See GLACIERS, ICE, OCEAN, SEA, WATERFALL and WATERWORKS,

Water, Ascent of (in plants). Water to supply the evaporation from the larger land-plants enters by the roots, especially the root-hairs, and passes thence into the woody strands which lie in the center of the root. These connect with similar strands in the stem, which run into the leaves and branch profusely, following the so-called veins and constituting the veinlets. The water travels chiefly in the interior of the minute, elongated tubes (ducts or vessels) which make up the greater part of these strands. These ducts are not continuous tubes, however, so that the water has to traverse the partition walls which occur here and there (abundantly in pines and their kin). The water is not forced up from below by the roots, except in low plants and at some seasons; it certainly does not rise by capillarity. No satisfactory understanding of the forces concerned has yet been reached, though the problem has been attacked by many investigators. See ROOT-PRESSURE, TRANSPIRATION and VASCULAR BUNDLES.

Water-Bug, the name for a number of aqueous insects inhabiting the streams and ponds of the United States. They belong to the order of true bugs, that is, they have the mouth-parts in the form of a sharp stylet or beak for sucking. The water boatman is one form, swimming on its back. The water-stick is a long, slim, water-bug. Water-bugs are interesting to study in aquaria and may be collected with an insect net, sweeping the bottom of a pond and the submerged plants. The water scorpion, also sometimes called the electric light bug, is the most formidable of all the water-bugs. It is about two inches long, with sharp, pointed forelegs with which it catches small fishes and frogs and sucks their blood. It flies from pond to pond at night, and is attracted by strong lights. See ELECTRIC-LIGHT BUG.

Wa'terbury, Ct., in New Haven County, 33 miles southwest of Hartford. It is on the Naugatuck River and surrounded by hills. It has a fine public park, a free library and other public buildings. It is known as the center of the brass manufacturing business of the United States, which began in 1802 with the making of gilt buttons. Electric wire, student-lamps, hinges, match-safes, clocks, watches, pins, hooks and eyes and percussion-caps are made by the million. Waterbury was settled in 1667. Population 61,903.

Wa'terfall or **Cat'aract,** a break in the slope of the bed of a river so abrupt that the water falls from the higher to the lower level. They usually occur in mountainous regions, where the streams flow from the mountain sides into valleys. The channel of the river must be rocky to form a fall, as the quantity of water would otherwise soon wear out a side channel. Some of the finest waterfalls are Orco Falls at Monte Rosa, 2,400 feet; Staubbach Falls in Switzerland, 1,000 feet; Zambezi Falls in Africa, 360 feet; Niagara Falls, 163 feet; and among the most wonderful in the world for their great width and the enormous volume of water which pours over them are the Falls of the Yosemite in California, 2,526 feet, the highest in the world.

Water-Lily, a general name applied to all members of the family *Nymphæaceæ*. They are aquatic herbs, native to all temperate and tropical regions. The stems are submerged, and the broad leaf-blades (lily-pads), on long petioles, float on the surface of the water. The true water-lilies are a species of *Nymphæa* or *Castalia*, the flowers being showy and of various colors. In the common species the petals are numerous and beautifully white and fragrant. The yellow pond-lily or spatter-dock is a species of *Nuphar*.

Wa'terloo', a village in Belgium, nine and a half miles southeast of Brussels, which owes its fame to the great battle fought in its neighborhood between Napoleon and Wellington, June 18, 1815. The French army numbered about 72,000 men, and Wellington's army numbered about 67,000, made up of British, German and Dutch troops. Napoleon supposed he had only Wellington's army to fight, as the Prussians had retreated before Ney on the 16th. But their retreat was toward Waterloo, and their arrival on the battlefield on the afternoon of the 18th turned the battle against the French, who, finding themselves hemmed in between the British and Prussians, fled in disorder. The roads southward were crowded with fugitives fleeing from the pursuing cavalry. One regiment of the guard which had covered Napoleon's retreat was surrounded and ordered to surrender; but their general, making the well-known answer: "The guard dies; it does not surrender," charged upon the enemy, and they perished almost to a man. The combined losses of this battle were about 50,000 men. Victor Hugo says the defeat of Napoleon was brought about by a rain the night before, which delayed the attack in the morning, thus giving the Prussian troops time to reach Waterloo; while others ascribe it to Grouchy's failure to obey orders. For a description of the battle see Hugo's *Les Miserables*. See NAPOLEON and WELLINGTON.

Waterloo, Ia., capital of Black-Hawk County, on both banks of the Cedar River, which furnishes water-power for its industries, northeastern Iowa, 94 miles west of Dubuque and 105 miles northeast of Des Moines. It is on the Waterloo, Cedar Falls and Northern, the Illinois Central, the Chicago and Great-Western and the Chicago, Rock Island and Pacific railroads. It is the center of a productive agricultural country and the shipping-point for large supplies of grain and produce. Besides the repair shops of the Illinois Central Railroad, the city's industries include flour-mills, foundries, carriage and machine shops, sash, door and blind factories, agricultural implements, gas engine and automobile works and refrigerators. It has admirable parochial and public schools, two high schools, a business college, Our Lady of Victory Academy (R. C.) and school libraries. Population 18,071.

Wa'termel'on, the fruit of *Citrullus vulgaris*, a species of the gourd family, and native to Asia and Africa. Over 60 varieties have been produced and catalogued.

Water-Ouzel. See OUZEL.

Wa'terspout', a phenomenon frequently observed in calm, warm weather at sea or on inland lakes, appearing under overhanging clouds, which, under certain influences, send downwards a funnel-shaped cloud, charged with vapor condensed from the atmosphere; and by its rotary indraught, on reaching the surface of lake or sea, it

attracts upwards a body of water or scudding, saltwater spray. The waterspout usually lasts but a few minutes, though under certain weather-conditions and meteorological influences many of them occur together. The condition that predisposes their appearance is the unstable equilibrium of the air, coupled with a gyratory motion imparted to it, which writhes and twists the cloud-spout in its rapid, tapering whirl. When observed at sea, at their bases the ocean is always violently agitated and massed in heaps with a leaping or coiling motion. Contrary to current belief, waterspouts are little affected by being fired at with cannon.

Wa'tertown, Mass., a town in Middlesex County, embracing a group of villages, an attractive suburb of Boston and six miles west of it, on the Charles River and the Boston and Maine Railroad. The place has an early history, being settled in 1630, and two years later made a protest against arbitrary taxation, on the occasion of being called upon to aid the construction of a fort at Cambridge. In the Revolutionary War the second and third provincial congresses of the state convened here; while to Watertown many people of Boston, driven from their homes by the British, came to reside. A national arsenal is situated here, and besides its municipal offices it has a library. Its industries include many manufacturing plants, embracing paper and paper-bags, hosiery and knitted ware and automobiles. Population about 11,500.

Watertown, N. Y., county-seat of Jefferson County, is on Black River, ten miles from Lake Ontario. The river crosses the city and falls 112 feet in about two miles, thus giving fine water-power for the manufactures of the place. Flour-mills, paper-mills, foundries, breweries, sewing-mahcine works and factories of paper flour-sacks, boots and shoes, cigars, carriages and sashes, together with the New York Air Brake works, are the most important of its manufactures. It also has a large trade with the fine agricultural region in which it is situated. The city annually expends $103,000 on its public schools, which have a force of 130 teachers and an enrollment of 4,600 pupils. It was settled in 1800, and became a city in 1869. Population 25,992.

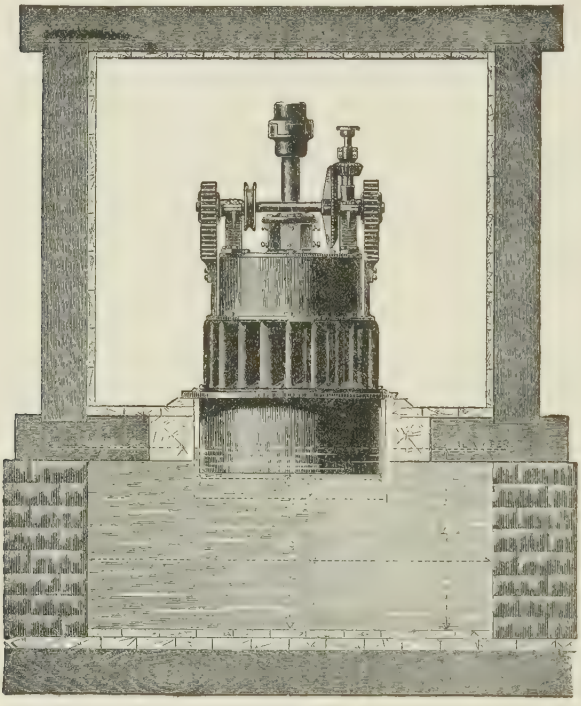
Watertown, Wis., a city in Dodge and Jefferson Counties, is on Rock River, 35 miles northeast of Madison. It has a large trade and a number of manufactories, as flouring-mills, threshing-machine works, brick, furniture and shoe and box factories. It is the seat of Northwestern University, a Lutheran institution founded in 1864, and of the University of the Sacred Heart (R. C.), chartered in 1872. It has admirable public and parish schools, a free public library and some fine churches. Population 8,659.

Wa'terville, Me., a town on the right bank of the Kennebec River, 18 miles northeast of Augusta. Ticonic Falls give it a fine water-power, around which are clustered the factories of boot-shanks, sash and doors, shirts, furniture, carpets, paper and woolen mills. Electric power for light and transportation has also been developed, and the Maine Central railroad-shops, the most extensive in the state, are located here. It is the seat of Colby College, a Baptist institution, which was first called Waterville College, becoming Colby College in 1867. It has several fine buildings and a library of 35,000 volumes; besides, there are Coburn Classical Institute; Ursuline Academy (R. C.); an excellent system of public and parish schools; and school libraries.

Watervliet (*wa'tĕr-vlēt*), **N. Y.** (formerly West Troy village, incorporated as a city since 1890), in Albany County, on the Hudson River, opposite Troy and a few miles north of Albany. Here, on a reservation, is Watervliet Arsenal, with its ordnance-constructing plant, powder and ammunition magazines etc., owned and operated by the national government. The Erie Canal passes through the reservation, and the arsenal controls considerable wharfage on the Hudson. The town grows apace, and in civic institutions, as well as in residences, begins to assume the status of a city. Population 14,513.

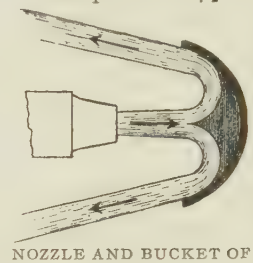
Water-Wheel, a wheel so arranged as to transform water-power into rotary mechanical power. The work done is due to the force of gravity on the water, and the possible work is equal to the fall multiplied by the weight of the water. To get the maximum work it is necessary that the water shall enter without shock and leave the wheel without further fall and velocity, conditions which of course, can only be approximated. But water-wheels give efficiencies which rival that of other prime motors. Efficiencies of over 90 per cent. have been reached, while efficiencies of 75 to 85 per cent. are commonly attained in the best wheels. Water-wheels have been used from a very remote period in human history. Up to about 1825 practically all wheels used were of three types: overshot, undershot and breast wheels. These were wheels revolving on horizontal axes. They had buckets or paddles on the circumference. As the name implies, the water fell from above into the buckets of the overshot wheel, while in the case of the breast wheel the height of the water was about that of the axis of the wheel, and in the undershot wheel the water flowed below and moved the wheel by impact against the blades. The overshot and breast wheels commonly reached efficiencies of from 75

to 80 per cent., while the efficiency of the undershot wheel was much less. The above-named wheels are seldom used now, except in small powers and in old mills. The two kinds of wheels used to-day are turbine-wheels and impact wheels of the Pelton type. The turbine wheel was introduced into France by Fourneyron about 1827, and from there soon afterwards into England and the United States by Fairbain and by Boyden. The peculiarity of the turbine is that the water flows between curved channels, so that it impinges on the vanes or buckets of the turbine tangentially, and thus by force of reaction rotates the turbine. The vanes of a turbine are commonly warped surfaces, shaped for local conditions and according to the special ideas and experience of the designer. The older turbines revolved about a vertical axis, but many modern turbines have horizontal axes.



TURBINE-WHEEL

There are three methods by which the water has been led into the wheel: from the center outward, from the rim inward, and from above downward through the wheel. Turbines are smaller and have a higher speed of rotation than older kinds of wheels. They run with greater regularity, and their efficiency is equal to, if not greater than, most of the older wheels. An efficiency of from 85 to 90 per cent. is common. The most powerful turbines ever built are those for the Niagara Falls (*q. v.*) electric plant. There are ten of these, each with a capacity of 5,000 H. P. The water has a mean head of 136 feet and is led through a steel penstock 7½ feet in diameter. The wheels are 63 inches in diameter and make 250 revolutions per minute. The shafts of the turbines carry directly the revolving parts of the generators for this great plant. Since about 1880 a special form of water wheel, called the impact wheel, has been developed and introduced in California. The Pelton water-wheel is the best known of the impact wheels. It is used where the head is very great. A jet of water is led against the steel buckets on the edge of the wheel, and these are so shaped as to throw the water off to the side. Pelton wheels are used in practically all the long distance electrical transmission lines in California where the head is high. In the Fresno plant the water-head is 1,400 feet, and the Pelton wheels have an output of 1,000 H. P. The use of water-power in the world has been increased by the development of long-distance power-transmission by electricity. It is estimated that 5,000,000 H. P. in water-power can be made available in the United States by electric transmission, and a recent writer in *The Engineering Magazine* places the water-power of Italy that can be made available by electric transmission as over 1,000,000 H. P. The use of water-wheels is thus likely to increase. A. P. CARMAN.



NOZZLE AND BUCKET OF PELTON WATER-WHEEL

Water-Works, a system of pipes and conduits connected with reservoirs or pumping-stations for the supply of water to communities. The ordinary supply of water to communities where the population is scattered is from shallow wells, but in crowded cities such wells become very dangerous on account of the contamination of the water by impurities from the soil. The water-supply of large cities often forms a very difficult problem, and large reservoirs and long conduits often have to be built to get an ample supply of pure water. The common sources of supply are streams, lakes, springs and wells. If the water is derived from streams or lakes, the great difficulty is to get a drainage-area which has not been rendered impure by the refuse of the sur-

rounding population. The water of New York City is derived from the watershed of the Croton River and is led into reservoirs in New York City (*q. v.*) through an aqueduct 29.6 miles long. This aqueduct has an average diameter of over 13 feet. (See *The Century Magazine* for December, 1889.) Chicago and Cleveland pump their water from the neighboring lakes, a tunnel of several miles being bored out under the lakes in each case so as to secure water free from shore refuse. Where the water for public supply is taken from wells, the wells are always sunk or driven several hundred feet into the lower strata, where the supply is more constant and is freed from surface impurities. Two systems of distribution are in use: the reservoir and the pumping system. In the reservoir system the water is collected by natural flow or by pumping into reservoirs and then distributed by gravity to the houses. In the direct-pumping system the water is pumped into the mains by pumps which are kept working day and night. The latter system is cheaper to install, but more expensive to operate. Where there is no natural elevation for a reservoir, it is common to erect a large, steel stand-pipe, which will have sufficient capacity to furnish part of a day's supply. The daily consumption of water in American cities is about 100 gallons per person. This is from two to three times the amount used in European cities. To check the waste of water, it is common now to supply water by meter, so that each user pays according to the amount consumed by himself.

Wat'son, Rev. **John** (*nom de plume* Ian Maclaren), one of the most popular of the Scotch school of story-writers and a prominent figure in English religious life, was born of Scottish parents at Manningtree, Essex, Nov. 3, 1850, and educated at Edinburg University and at Tübingen. Ordained a minister of the Free Church of Scotland, he had his first important charge at Free St. Matthew's, Glasgow, and afterward was transferred to the Sefton Park Presbyterian Church, Liverpool. Till 1893 Dr. Watson was known as an able and popular preacher; but in that year he acquired greater distinction and a wider fame by a series of Scottish prose idyls, written for *The British Weekly* and afterwards published under the title of *Beside the Bonnie Brier Bush.* This work won deserved praise for the fidelity with which he has portrayed humble and reverent Scottish life and scenes, and was deservedly dramatized. The volume was followed by *The Days of Auld Lang Syne, Kate Carnegie, A Doctor of the Old School, Rabbi Saunderson* and *Afterwards and Other Stories.* His religious writings embrace *The Upper Room, The Mind of the Master, The Cure of Souls, The Homely Virtues, The Inspiration of Our Faith, The Potter's Wheel* and *Companions of the Sorrowful Way.* In 1896 and again in 1899 he visited the United States on lecturing tours, and delivered the Lyman Beecher lectures at Yale University on practical theology. He also visited the United States in 1907, where he died at Mount Pleasant, Iowa, May 6.

IAN MACLAREN

Watson, John Crittenden, American naval officer (rear-admiral in command of the Asiatic station, with pennant on United States battleship *Oregon*), was born at Frankfort, Ky., Aug. 24, 1842, entered the United States Naval Academy in 1856, and graduated in 1860. From 1862 to 1864 he acted as aid to Admiral Farragut on the *Hartford*, and took part in forcing the Mississippi River and capturing New Orleans; he was wounded at the battle of Mobile Bay. From 1865 to 1867 he served on the *Colorado* in the European squadron, and was promoted to commander in 1874, to captain in 1887, and to commodore in 1897. In the war with Spain he commanded the blockading squadron on the northern Cuban coast on the *Newark.* In June, 1898, he was given command of a squadron designed to operate against the coasts of Spain, but the collapse of the war rendered the project unnecessary. In June, 1898, he was appointed commander-in-chief of the eastern squadron.

Watson, Thomas (1557–1592), was one of the English lyrical poets who inaugurated the great outburst of Elizabethan literature. He is known to have attended Oxford University and to have studied law in London. He was an elegant and celebrated Latinist. His Latin translation of the *Antigone* of Sophocles appeared in 1581. He also translated Tasso's *Aminta* into Latin pastoral form. His English works include the *Tears of Fancy*, a beautiful collection consisting of 60 sonnets, some of which appear to have been utilized by Shakespeare. Watson also wrote a book of 100 professed sonnets, which had 18 lines each instead of 14; this he called *The Passionate Century of Love.* His themes are largely from the French and Italian. His English verse is published in Arber's *English Reprints.*

Watson, William, an English poet, born at Burley, Yorkshire, on Aug. 2, 1859; his writings have given him prominence of recent years. *Epigrams of Art,* 1884, was his first book to attract attention. In *The National Review,* 1885, he published a series of sonnets entitled *Ver Tenebrosum,* in which

he attacked the English policy in Egypt. In his poem on *Wordsworth's Grave* gave him considerable fame. His verse is careful, delicate and sure in workmanship, and is reflective in tone. His sonnets in *The Purple East*, are noteworthy, while *The Year of Shame* is a forceful indictment of England's policy in the Orient.

Watson, William, an American scientist, was born in Nantucket, Mass., 1834. He was graduated at Harvard, 1857. In 1860–63 he gathered information which was used in 1864 in founding the Massachusetts Institute of Technology. He was professor of mechanical engineering and descriptive geometry in this institution during 1865–1873. He became secretary of the American Academy of Arts and Science in 1884.

Watt, James. Everybody has heard the story of James Watt and his boyhood experiment of the lifting power of the steam from the spout of his mother's teakettle. What boy's heart has not swelled with indignation when reading of his good aunt's rebuke for the lad's idleness! Whether this story be true or not, no less a person than Andrew Carnegie says we should cherish it among our most precious legends, along with the stories of Washington and his hatchet and Bruce and the spider, because it condenses an inspiring genius into an illuminating anecdote.

JAMES WATT

It is a beautiful picture, that of the home-life of James Watt, in the fishing-town and customs-port of Greenock, Scotland. Born there on the 19th of January, 1732, a delicate, sensitive lad whose life was preserved only by the most tender care, he was fortunate in having a father of means and importance, a comfortable, tranquil home and a mother who was known to the fisher-folk as "the beautiful leddy." Unable to attend school regularly because of ill-health, he followed his own inclinations in study and amusements. Long days were spent in rambling among the hills and lakes back of the town, developing strength and turning his thoughts toward botany, geology and water-power. He was no less interested in his father's shipbuilding yards and in the docks. He loved to sit in the window of the parlor fronting the harbor and watch the herring-boats come in and the big sailing vessels laden with tobacco from Virginia, riding at anchor in the broad estuary of the Clyde. Who could imagine that this fragile, dreaming boy was to transform his native town from a straggling village of thatched cottages into a big, bustling seaport with shipbuilding yards that construct the Cunard and other famous lines of steamers?

From the age of 14 natural philosophy, chemistry and anatomy interested him intensely, and he lost no opportunity to put every statement made by books to the test in nature's great laboratory. In his father's shops he became so skilful in the use of tools that the workmen said of him: "Wee Jamie hae a fortune in his fingers, an' anither in his heid." Because he could not always have tools to use, he set up a forge of his own and made and repaired tools for himself. The mathematical exactness and thoroughness of his work there were the foundations of his future inventions and fame. It was intended that the gifted boy should go to Glasgow University and be fitted for a professorship in physics. The Scotch people, perhaps, have a profounder love and respect for learning, and will make greater sacrifices to get an education, than any other people on the globe. So, when the ambition of the Watt family for Jamie had to be put aside because of the loss of a vessel at sea and other financial misfortunes, the disappointment must have been bitter indeed. The lad went to London at 19 to learn the trade of scientific instrument-making — rulers, compasses, scales and such things, for which he showed talent. It took 12 days' hard riding on horseback to make the journey of 400 miles. Today the distance is covered in nine hours.

Within a year he was back in Glasgow, a competent workman, but poor and sick, with work so scarce that he was barely able to earn his bread. Repairing the astronomical instruments for the university led to his appointment as mathematical instrument-maker, with a shop in the college precincts. He was very little better off in the way of money than before, but the connection brought him the friendship of learned professors and the handling of complex instruments and machinery, every one of which involved the study of physical laws. For instance: the putting of a piano in order led him into acoustics. So James Watt's fingers were all the time educating his "heid."

So much reliance was placed upon his skill and his understanding of principles that a small model of a steam-pump was put into his hands for repair. The first thing Watt did was to make a thorough investigation of the whole subject of steam, including condensation and latent heat, to see why this pump, then used in British coal-mines, used so much steam and got so easily out of order. In a word, he set about the task, not of repairing, but of improving and developing a crude and wasteful contrivance. It took a year of close study. But let the inventor tell the story: "One Sunday morning when I had gone for a walk in the Green of Glasgow, the idea occurred to me that, as steam is

an elastic vapor, it would expand and rush into a vacuum. The *separate condenser* would take care of the exhaust, and the steam-jacket keep the cylinder hot. I rushed back to the university and broke in upon Dr. Robison, lecturer on chemistry and cried: 'You needna fash yoursel' aboot that ony more, mon; you shall have steam boiling hot, in a boiling hot cylinder, and not waste a particle.'" The stationary steam-engine had been born in James Watt's brain — a flash of genius, it has been called. Such it was, but it was the result of profound knowledge, intense application and patience.

Now, at this stage, James Watt's skilful fingers came again to the service of his head. The practical difficulties were enormous. Money and powerful friends were forthcoming, but the necessary mechanical skill for making all the parts true did not exist. The inventor had, literally, to invent other machines and to train workmen. It was ten years before the steam-engine was brought to perfection and protected by patents. Even then people refused to believe that it was anything more than a steam-pump limited to pumping water out of mines and for use in water-works. Sir Richard Arkwright was one of the first to set the stationary engine to the task of driving the machinery of his cotton-factory. During the next 30 years the engine was brought to perfection and applied to every practical use. The steam-gauge and governor were added. The inventor's partner in manufacturing engines was Matthew Boulton of Birmingham. Their sons succeeded them in business.

At 64 James Watt, having, as he said, "a sufficient fortune," retired to the country and spent nearly 20 years as an experimental philosopher and physicist, — in his many interests and activities resembling our own Benjamin Franklin. "What is life without a hobby to ride?" he is quoted as saying. He always had some scientific hobby to engage his inquiring mind. Now it was the composition of water, now an illuminating gas; again, a uniform system of weights and measures or the fertilizing of his broad farm-lands. At the very last he perfected a machine for copying statuary, presenting antique busts to his friends "from Jamie Watt, a promising young artist just entering his 83d year." With the eagerness of a boy he experimented in his laboratory on his rural estate near Birmingham, "wearing out my life, not rusting," until he fell asleep on the 19th of August, 1819. A monument to his memory was erected in Westminster Abbey. The poet Wordsworth calls Watt "in the magnitude and universality of his genius the most extraordinary man England ever produced. He never sought display, but was content to work in that quietness and humility in which all that was truly great and good was ever done." See *Life of James Watt* by Andrew Carnegie

Wat'terson, Henry, American journalist and Democratic politician, was born at Washington, D. C. Feb. 16, 1840, and was educated by private tutors. Early in his career he took to journalism and at Nashville, Tenn., edited *The Republican Banner*. During the Civil War he served on the staff of the Confederate army and was chief of scouts under Gen. Joe Johnston. He subsequently settled at Louisville, Ky., where he founded and has since edited *The Courier-Journal*, which he has made one of the foremost Democrat newspapers. During 1875–7 he was a member of Congress, but, though repeatedly urged, he has uniformly declined office, and has contented himself with presiding over conventions and supporting his Democratic friends and allies in their political contests. At Chicago, in 1893, he delivered the dedicatory oration at the opening of the Columbian Exposition. In 1896 he declined the offer of a nomination for President on the National (gold) Democratic ticket. He has published a *History of the Spanish-American War*, and edited *Oddities of Southern Life and Character*.

HENRY WATTERSON

Watts, George Frederick, R. A., a noted English artist, sculptor, portrait-painter and delineator of historical subjects, was born at London on Feb. 23, 1817. He first exhibited at the Royal Academy in 1837, his early pictures winning attention by their colossal size as well as by their artistic excellence and beauty of coloring. His chief exhibits have been *St. George and the Dragon*, *Fata Morgana*, *Life's Allusions*, *Endymion*, *Love and Death*, *The Good Samaritan*, *Hope*, *Sir Galahad*, *Orpheus and Eurydice*, with portraits of *Tennyson*, *Browning*, *Gladstone*, *Lord Lytton*, *Matthew Arnold*, *Holman Hunt*, *Swinburne*, *Dean Stanley*, *Garibaldi* and *John Stuart Mill*. *Love and Life* was later presented to the United States, and is in the White House. In 1867 Watts was elected an academician. He died at London on July 1, 1904.

Watts, Isaac, an English hymn-writer, was born at Southampton, July 17, 1674. He is said to have written hymns for his mother when seven or eight years old. He became a clergyman, and was pastor of Mark Lane Congregational Church, London, for a number of years, having an assistant and preaching only occasionally, as his

health was permanently injured by overstudy when a young man. In 1712 a visit to Sir Thomas Abney, a London alderman, led to making his home with this friend for the remainder of his life. He wrote a number of theological works, a treatise on *Logic* and a volume on *The Improvement of the Mind*, which has been much used as a textbook. His reputation, however, is due to his hymns, of which he published three volumes. A large number of his hymns and psalms are retained in church collections, many of them our best-known hymns, as *Before Jehovah's Awful Throne; O God, Our Help in Ages Past; Joy to the World, the Lord has Come;* and *Come, Holy Spirit, Heavenly Dove*. His beautiful cradle-hymn, *Hush, My Dear, Lie Still and Slumber*, perhaps is the best known of his children's songs. He died on Nov. 25, 1748. Consult Hood's *Life* and Julian's *Dictionary of Hymnology*.

Wauke'gan, Ill., county-seat of Lake County, on Lake Michigan, is 35 miles north of Chicago. It is built on a bluff on the shore. On account of its mineral springs and pleasant situation, it is quite a popular summer-resort. There are several important industries, among them a sugar-refinery, wire-mills, brass-works, scale-works, sash and door, organ-stop, envelope and wire-fence factories, a planing-mill, a malt-house and brewery, a coal-dock and a salt-dock. At North Chicago, a village a few miles south on an electric railway, are large zinc-works, a foundry, a hardware-factory, a brass-factory, and here the government has a naval training-school. North Chicago has a population of 2,000; Waukegan of 16,000.

Waukesha (*wa'kê-sha*), **Wis.,** county-seat of Waukesha County, a city of Wisconsin, 20 miles west of Milwaukee. Is one of the most popular summer-resorts in the country. It is served by three railroads, has electric communication with Milwaukee and other cities, and contains large malleable iron and steel works. There are ten mineral springs, the Bethesda being the largest and the first discovered, in 1868. The water is shipped to all parts of the world, the works covering 20 acres. There are a very large hotel and fine bathing-houses, with beautiful parks and drives. Population 7,800.

Wau'sau, Wis., a city on the Wisconsin River, the capital of Marathon County, central Wisconsin. It is on the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern railroads, and is 180 miles northwest of Milwaukee. It lies in a heavily timbered pine-belt, and its industries, consequently, are chiefly mills for dressing lumber and the manufacture of furniture, sashes, doors and blinds, together with planing-mills. It also has machine-shops, foundries, tanneries and cigar factories, besides mining and granite-quarrying. The city is growing rapidly, is being connected with adjacent towns by electric street railway, is in the center of a fine dairying country. Marathon County is said to have the finest herd of Guernsey cattle in the world. Population 15,210.

Wave-Mo'tion, a state of disturbance being propagated from one part of a medium to another. A body is said to be *disturbed* when it is thrown out of equilibrium. Thus a stone dropped into quiet water produces a disturbance which at a later instant may reach a point several yards away. And since a body is in equilibrium only when its potential energy is a minimum, a disturbance implies the addition of energy to the system. Indeed, wave-motion might be defined as one of the two principal methods for distributing energy, the other being *currents*.

In any consideration of wave-motion, it is quite important to distinguish carefully between the motion of the wave and the motion of the particles of the medium through which the wave is traveling. Waves are roughly divided into two classes according to the motion of the particles. If these motions occur in the same direction in which the wave is traveling, the wave is said to be a *longitudinal* one; but if the particles are displaced in a plane which is perpendicular to the direction of propagation, the wave is said to be *transversal*. If the period of vibration of one of the disturbed particles of the medium is T, and the length of the wave be λ, then the speed of the wave V is given by the following equation:

$$V = \frac{\lambda}{T}$$

This is a perfectly general expression, true for all kinds of waves whatsoever.

Following is an outline of some of the more important types of waves met with in nature:

Water-Waves. These are the ordinary waves encountered at sea and at the seashore. They really are due to gravitation, which tends to pull down the crest and elevate the trough of a disturbance as if the surface of the water were elastic. They are more properly called *surface waves*.

The motion of the small particles which make up the water must be carefully distinguished from the motion of the waves. The motion of the particles in surface waves is in a circle, which gives to the outline of the wave a form very approximately that of a trochoid. The speed with which water waves travel depends very greatly upon the depth of the water.

If the depth of the water is greater than half a wave-length, the speed of a wave is $\sqrt{\frac{g\lambda}{2\pi}}$, where g is the acceleration of gravity and λ is the length of the wave. The longer the wave, therefore, the faster it travels. But in the case of shallow water the speed of the wave is

$\sqrt{gh}$, where g, as before, is the acceleration of gravity and h is the depth of the water. The speed of waves in shallow water is, therefore, independent of wave length.

Ripples. In the case of water waves which are very short — say less than about 4 millimeters — the surface tension (*q. v.*) of the water is the principal factor in determining the speed of the waves, which is $\frac{2\pi T}{\lambda \rho}$, where T is the value of the surface-tension, λ the wave length and ρ the density.

The slowest of all waves are those which are about 16 millimeters long. Waves shorter than this are called ripples. It is important to note that the speed of ripples, unlike that of waves, varies *inversely* as the wave-length.

Waves in Stretched Strings. These waves are seen when a stretched clothes-line is struck with a walking stick. They occur also in all stringed musical instruments and often in long belts in power-houses. The speed of the wave here depends upon two factors only: the tension or the force with which the string is stretched, say F, and the mass per unit-length of the string, say μ.

Then

$$Speed = \sqrt{\frac{F}{\mu}}$$

Sound Waves. These travel in gases, liquids and solids. The character of these waves is described in Acoustics. There also will be found the evidence for thinking that sound is a wave-motion.

The speed of sound-waves in air was first computed by Newton and Laplace, and found to be as follows:

$$Speed = \sqrt{\frac{\gamma p}{\rho}}$$

where p denotes the pressure of the air, ρ its density and γ a constant, *viz.*, the ratio between the specific beats of air at constant pressure and at constant volume.

In the case of a sound-wave traveling in water we have

$$Speed = \sqrt{\frac{Bulk\ Modulus}{Density}}$$

But in case sound travels through a solid rod, as, for instance, a fence made of gas-pipe, we have

$$Speed = \sqrt{\frac{Young's\ Modulus}{Density}}$$

Light Waves. The evidence that light consists of a wave-motion is presented in Light. Concerning the nature of light-waves very little is known; but it used to be thought that they were elastic disturbances in a solid ether, in which case the speed of light waves would have been given by the following equation:

$$Speed = \sqrt{\frac{Rigidity\ of\ Ether}{Density\ of\ Ether}}$$

It is now generally believed that light consists in electrical disturbances of the ether, in which case the speed of light waves would be determined as follows:—

$$Speed = \sqrt{\frac{1}{\mu\kappa}}$$

where μ is the magnetic permeability of the medium and κ the specific inductive capacity of the medium.

Besides these, there are many other kinds of waves, as the tides, barometric waves, temperature waves, solitary waves etc., the discussion of which is beyond our limits of space. For these, as well as the composition of waves, stationary waves etc., the larger treatises must be consulted. One of the best of these is Lamb's *Hydrodynamics.*

Henry Crew.

Wax is a solid, fatty substance of animal and vegetable origin. It is harder than fat, and does not melt so easily. It will not dissolve in water, and burns with a bright flame. Bees' wax, Chinese insect-wax and spermaceti are animal waxes, while Japanese wax, palm-wax and myrtleberry-wax are vegetable waxes. Bees' wax is secreted by the bees, and forms the cells in which they store honey. It is prepared by draining out the honey, melting the comb in boiling water, and collecting the wax from the top of the water as it cools. It is, in its natural state, a light yellow color, and is made into white wax by bleaching. It is produced in large quantities, and used mainly for the manufacture of candles. Chinese wax is supposed to be the product of an insect. It is found as a thin white coating on the branches of certain trees, and is removed with boiling water. It is white, like spermaceti, and is used for candles. Japanese wax is got from the fruit of a tree by boiling it and collecting the wax; palm-wax is scraped from the branches of two kinds of South American palms; and carnauba wax is found on the leaves of the carnauba palm, and is obtained by drying the leaves and shaking off the wax like dust. Myrtleberry-wax or candleberry-wax is made from the berries of the wax-myrtle or bayberry, and, as it burns about as well as bees' wax and costs only a quarter as much, it is largely used. Mineral wax is a substance found oozing in small quantities from rocks in coal regions. Paraffin, produced from shale and petroleum, is also much used as a wax for candles etc. See Bees, Paraffin and Spermaceti.

Wax'wing', the name for birds having the wings, at times, ornamented with small

spots that look like red sealing-wax. There are two species in North America, the cedar-bird and the Bohemian waxwing. The former nests from Virginia to Labrador, and is found in winter from Massachusetts south to Costa Rica. It is about 7.2 inches long, with a plumage grayish brown above and yellowish below. There is a black stripe running across its face, and the head is crested. The secondaries of the wings are sometimes provided with red, wax-like tips. These birds live in flocks and fly in close rank. Their food varies with the season, but consists largely of cedar-berries, soft fruits and insects. The Bohemian waxwing is a more northern bird, but is found south in winter. It is slightly longer than the cedar-bird, and has a distinct purple cinnamon color on the head. Similar birds are found in Europe.

Way'land, Francis, an American clergyman, was born at New York, March 11, 1796. He graduated at Union College, and studied both medicine and theology, becoming pastor of a Baptist church in Boston. In 1826 he was made president of Brown University, Providence, R. I. He was one of the first teachers to make the study of Greek and Latin a matter of choice in a college course. He is well-known as a writer, his works on moral science and intellectual philosophy having been quite generally used as textbooks. He died at Providence, R. I., Sept. 30, 1865.

Wayne (*wān*), **An'thony,** American general, was born at Waynesborough, Pa., Jan. 1, 1745. He became a surveyor and was selected by Benjamin Franklin to form a settlement in Nova Scotia. When the Revolutionary War began, he raised a regiment of volunteers, and served first in Canada, at the battle of Three Rivers, and in command of Fort Ticonderoga. While with Washington in New Jersey, he commanded the rear-guard at Brandywine, led the attack at Germantown, captured supplies for the army at Valley Forge, and surprised the garrison at Stony Point on the Hudson, one of the most brilliant operations of the war, for which he received a gold medal and the thanks of Congress. In Virginia he saved Lafayette's forces, and assisted in the capture of Cornwallis. He was made major-general and commander-in-chief in the war against the Indians in 1792, and was made the commissioner to treat with the Indians and to take possssion of the British forts in the northwest. He gained the title of Mad Anthony by his dash and bravery. He died on his western expedition at Presque Isle (now Erie), Pa., Dec. 15, 1796. Consult *Life and Services* by Moore and Sparks' *American Biography.*

Weasel (*wē'z'l*), the name of a number of small, carnivorous mammals related to the sable, mink and skunk, the smallest members of the marten family. They have a remarkably slender, round body with a long neck, which gives the animal the appearance of having the fore legs set back too far. The legs are very short. The weasel can twist and wind its supple body in a fashion very like a snake, and enter holes where only a snake could follow. The common weasel, found both in the Old and the New World, reaches a length of eight or ten inches; it is light, reddish brown and whitish below, and in northern districts becomes whitish in winter. It feeds on mice, moles and rats, following them into their holes, and even rabbits, grouse, chickens and ducks the bold creature attacks. It also visits birds' nests, is reputed to kill for the pleasure of killing, and is called bloodthirsty and wasteful. It ranges in America east of the Rocky Mountains, and south to the border of the southern states. The stoat or ermine likewise inhabits Europe, Asia and America, ranging east of the Rocky Mountains, from the extreme northern limit of terrestrial animals to the southern states. It is eight to eleven inches long. In summer its color is mahogany brown, with a black tip to the tail. In winter it changes, in northern regions, to a pure white except at the tip of the tail, which remains black. Other examples are the brindled weasel of the western coast, found from California to Ecuador, and the long-tailed weasel of the northwest.

Weav'er-Bird, the common name for a number of sparrow-like birds that show especial skill in weaving their nests. This is so thoroughly fixed a characteristic, that they keep up their weaving habits in cap-

YELLOW-CROWNED WEAVER AND NEST

tivity when material can be obtained, even weaving fibers about their cages. There

are about 250 species of this bird, belonging mainly to Africa. Those outside of Africa inhabit the oriental region and Australia. There are none in New Zealand or America. They are small birds, usually of plain colors, but the males become brightly colored during the breeding season. The nests, while varying greatly in size and solidity, all bespeak remarkable skill in construction. Some of the weavers construct hanging nests, shaped like a pouch and suspended from high, slender branches. They are closely woven and elongated into a tube opening from below. The social weavers of South Africa are the most noteworthy. A number of birds unite in building an umbrella-shaped structure of coarse grass to form a protection for their nests. The individual nests are placed below this roof and open downward. The roof not only sheds the rain, but enemies like snakes and other animals will slip from it in attempting to get to the nests. As many as 800 or 1,000 nests have been found under a single canopy. Year after year the nests are added to; sometimes they break the branches by which they are supported.

Weav'ing, the art of making cloth by interlacing threads of any substance, as cotton or wool. The machine employed is a loom, which has been improved from the simple hand-looms of the Egyptians and other ancient nations to the complicated machines used at the present time in weaving silk, cotton, carpets and other woolen goods. The introduction of the power-loom instead of the hand-loom dates back two centuries, the first successful one being the invention of Cartwright in 1784, of which the Jacquard loom is the most important improvement. The process of weaving is seen best in the common mode of darning, where a set of lengthwise threads are first fastened firmly and then crossed by other threads, which are woven in and out by taking up one thread and leaving one. In weaving, the threads are fastened in the loom, as many as are necessary for the width of the goods. This is called the warp. The cross thread is wound on spools or bobbins in a shuttle, and forms the weft or wool. By a movement of the loom the alternate threads are raised and the shuttle passes between the two sets of threads. In hand-looms the shuttle is thrown by hand, but moved by machinery in the power-loom. The raised threads are then lowered and the lower threads raised, and the shuttle returned to the side whence it came, crossing in this way the threads alternately. The thread in the shuttle is thus carried back and forth, forming the well-known "selvedge" to woven goods. When every other thread is taken up, it is called plain weaving, but there are many varieties introduced, as taking up one thread and leaving two or three etc. The quality of the threads also varies, making wool goods with cotton or silk warp, velvet with silk or linen warp etc. The colors and figures are sometimes stamped on plain goods, when the "wrong side" will present a plain surface; in other goods they are made in the weaving by the use of colored threads. Consult Watson's *Theory and Practice of the Art of Weaving.*

Webb, Alexander Stewart, American general and since 1869 president of the College of the City of New York, was born at New York, Feb. 15, 1835, and graduated in 1855 at West Point, when he entered the United States army, artillery branch. In the Civil War he served in the army of the Potomac, was chief of staff of the fifth corps in the Maryland and Rappahannock campaigns, was wounded at Gettysburg, where he commanded a brigade, commanded a division in the Rapidan campaign, and led a brigade at the battles of the Wilderness and Spottsylvania (being severely wounded at the latter), and was chief of staff to General Meade till the close of the war. He subsequently held several important army posts until he retired from the army in 1870, acting also as a professor at West Point, until appointed president of the College of the City of New York. He is the author of a work on McClellan's campaign of 1862, entitled *The Peninsula.*

Webb City, Mo., situated in Jasper County on the Missouri Pacific and the St. Louis and San Francisco Railroad, with electric trolley communication with Joplin (six miles distant). It lies near Carthage and about 160 miles south of Kansas City, and is engaged chiefly as a mining center, with a large number of iron, lead and zinc mining plants in and about the city. In the vicinity there also is a fine farming and fruit-growing region. Its institutions embrace, besides public buildings, several banks, newspapers, schools and churches, together with theaters and opera-houses. In addition to the iron-works industry of the city, it has a foundry and machine shop and a flour-mill. Population 11,897.

Weber (*vā'bĕr*), **Karl Maria von,** a German composer, was born in Holstein, Dec. 18, 1786. He early showed the musical genius which he inherited from his father. By the time he was 14, he had already composed two operas, the second one, *The Forest Maiden*, being put on the stage. He held several positions, such as conductor of the opera at Breslau, musical instructor in the family of Duke Louis at Stuttgart, director of the opera at Prague and at Dresden and musical director to the king of Saxony. His work includes operas, symphonies and overtures for the piano, clarionet, oboe, bassoon and violoncello and a large number of songs, among them a series of national songs from Körner's *Lyre and Sword*, which roused the patriotic

sentiment during the war of liberation. His best opera, *Der Freischütz* (The Archer), was produced in 1822 at Berlin, and created a great sensation throughout Europe, so that Charles Kemble asked him for an opera for the English stage. *Oberon* was written in answer to this request, and brought out under his own direction at London in 1826, where he was greeted with enthusiastic applause. He died while on this visit to England, June 5, 1826. Consult *Life* by his son, translated by Simson.

Weber, Wilhelm Eduard, who has been called the Nestor of German physicists, was born at Wittenberg on the 24th of October, 1804. At the suggestion of Gauss he was appointed professor of physics at the University of Göttingen; but in 1837 he was compelled to resign on account of antagonism to the state authorities. Living for the next six years as a private citizen, he was in 1843 appointed to the chair of physics in the University of Leipsic; but he was recalled to his old post in Göttingen in 1849. The volume on *The Theory of Waves* (Wellenlehre), which he published with his brother, E. H. Weber, in 1825, is the first scholarly, experimental treatment of water-waves in existence. But perhaps Weber's chief service to science was the introduction of the absolute system of units into physical measurement — a work which he performed conjointly with Gauss. The invention of the earth-inductor and of the electrodynamometer is also due to Weber. As early as 1833 Gauss and Weber had connected the observatory and physical laboratory at Göttingen by means of a telegraph line. Weber died at Göttingen, June 23, 1891.

Web'ster, Mass., a town, embracing a group of villages in Worcester County, on the French River and on the Boston and Albany, and the New York, New Haven and Hartford Railroads, 16 miles south-southwest of Worcester. Incorporated in 1832, the town owns and operates its local waterworks, and, besides its municipal buildings, has a public library, together with good schools and attractive churches. Its chief industries, in addition to those connected with the railroads, embrace cotton and woolen mills, shoe-shops etc. It also has several newspapers, a national bank, a number of hotels; there is, moreover, a lake of 1,200 acres in extent in the neighborhood. Population 10,500.

Webster, Daniel. In January, 1830, an event of historical significance occurred in the United States senate. "Black Dan" Webster, senator from Massachusetts, delivered a speech that made him the Nestor of American orators in the golden age of American oratory. It was made in reply to a speech by Senator Hayne of South Carolina, who had declared that the Federal government was but a loose confederation of sovereign states and that the states could refuse to obey laws of Congress. Webster and President Jackson, who was at odds with his own party on this question, saw the dangers of this doctrine of nullification and joined hands across party lines in patriotic determination to stamp it out.

DANIEL WEBSTER

Webster rose to speak to packed galleries. In appearance he was grave and dignified, with the noblest head America has produced. He was smooth-shaven, heavy-featured, with swarthy skin, brilliant eyes and beetling brows. His rich voice had the range and melody of a chime of bells. The simplest man could follow his plain diction, while his logic and weight of argument delighted and convinced the most learned. He showed clearly that the doctrine of nullification could lead, logically, only to disruption and civil war. The speech was a defense of the Federal constitution and an appeal to national patriotism. It lifted the whole question of states' rights from the plane of a political theory to that of national ethics. One who heard it said: "That is the greatest oration since Demosthenes' *On the Crown.*"

The man who made it was born on Jan. 18, 1782, at Salisbury, N. H. How often, in reading the lives of great men, do we find them so frail in childhood that it was not thought probable they would live to maturity! Daniel was so delicate that he was the only member of a pioneer family who was exempt from hard labor. His mother, a woman of uncommon intellect and force, early discovered the boy's remarkable mental powers, taught him all she knew and insisted upon his entering the local academy. When he was 15 it was decided at a family conference, that he must go to college, no matter at what cost of toil and self-denial of the others. The sensitive boy burst into tears at this proof of devotion and confidence in his ability. In order to repay it, in part, when he graduated from Dartmouth College, he taught in an academy in order to send his brother, Ezekiel, to college. When admitted to the Boston bar in 1805, he located in the small town of Boscawen, N. H., in order to be near his father, who died a year later. Returning to Boston, he established a good practice, only to turn it over to his brother and to begin again in Portsmouth. American history records no finer example of family affection and loyalty than is furnished by the Websters. "Black Dan's" loyalty was wide as well as deep. In a Fourth of July oration, delivered at the age of 18, he made

an impassioned appeal for love of country, in a time when the people as a whole had scarcely outgrown their strong sense of separate, colonial origins.

So shy as a child that he could not stand up in school to speak pieces, Webster won such a reputation for eloquence at the bar that, at the age of 30, he was a member of Congress for New Hampshire, remaining four years, retiring to return to the Boston bar. His income soon rose to $20,000, a great sum in those days, and his reputation became national with his winning of the famous Dartmouth College charter case. In 1816 the New Hampshire legislature changed the charter given by King George III in 1769. The trustees appealed to the United States supreme court, and Webster won the suit on the contention that a state is forbidden to alter contracts. The decision was of national importance, because it asserted the authority of the Federal government over the states, and was a blow at the theory of states' rights. As a criminal lawyer, Webster won celebrity in his defense of a man named Knapp, on the charge of murder. In his summing up of the defense occurs the famous passage on conscience that has been declaimed by three generations of school-boys. The strength of Webster's arguments always lay in their being based on fundamental moral principles, whether they were delivered before the bar or in public orations. In this early period he made a trio of historical orations — one in 1820 on the second centennial of the landing on Plymouth Rock, one on the laying of the corner-stone of the Bunker Hill monument and one on the deaths of Adams and Jefferson, that served still further to place himself and his broad patriotism before the American public. Such a man could not escape the duty of public service. In 1823 he was again in Congress, this time for Massachusetts. In 1828 he was chosen to represent Massachusetts in the senate, and there he remained until his death in 1852, except while serving as secretary of state under Harrison and Tyler.

On many political questions of the day Webster seemed to vacillate, but, in perspective, he is seen to have been consistent to one principle. A free-trader, he became a protectionist on the ground, that since protection had been established, it must be maintained or business built up under it would be demoralized. Although opposed to the extension of slavery, he joined Clay in securing the passage of the Missouri Compromise. On the other hand he supported Jackson in the Force Bill which authorized the president to use the army and navy to enforce federal laws in any resisting state. The truth is that he hated nullifier and abolitionist alike, and fought every measure and every opinion which tended to divide North and South. He was concerned only with preserving the Union. As early as the great speech of 1830 he predicted civil war as the inevitable result of these sectional interests, but he helped to delay the conflict until the federal government was strong enough to meet the shock. In the meantime he sowed seeds of national patriotism broadcast by his impassioned eloquence and unanswerable logic of history. His uncompromising attitude on this question probably lost him the presidency, for abolitionist sentiment was sweeping over the north resistlessly, and must soon have swept him from the public arena where he had, for a generation, been a colossal figure. He died on Oct. 24, 1852, while serving as secretary of state under President Fillmore. Consult *Life* by E. P. Whipple and *Great Speeches* by Henry Cabot Lodge.

Webster, Noah, an American scholar, was born at Hartford, Conn., Oct. 16, 1758. He studied at Yale College and served in the militia under his father in the Revolutionary War. While a teacher at Goshen, N. Y., he published *Grammatical Institutes of the English Language.* He published books and lectured on political subjects, taught an academy at Philadelphia, practiced law at Hartford, edited a magazine and a newspaper, and wrote pamphlets on epidemic diseases, banking and international law. He was almost the first American to see the importance of Winthrop's *Journal* to the history of New England, editing and publishing it. He also was influential as a pamphleteer and a political publicist in the people's discussions of the federal constitution of the new nation. In 1807 he published a grammar and began his *American Dictionary of the English Language;* but decided to fit himself more perfectly for the work, and spent ten years in the study of the origin of the English language and its connection with other languages. Seven years were then spent on the dictionary, including a visit to Europe to consult books and scholars at Paris and at Cambridge. The dictionary was published in 1828 in two volumes in the United States, followed soon by an edition of 3,000 copies in England. It has long been a standard dictionary of the English language, and has passed through many editions and revisions. More than 300,000 copies have been sold yearly, and the income from the book still is about $25,000 a year. As celebrated as the dictionary is *Webster's Spelling-Book,* which was used for many years in every school in the land, and of which more than 70,000,000 copies have been sold. Webster also published a *History of the United States.* He was one of the founders of Amherst College and a member of the Massachusetts legislature while residing in Amherst, and of the Connecticut legislature when living at New Haven. He died on May 28, 1843.

Consult *Life* by Scudder in The American Men of Letters Series.

Webster, Pelatiah, justly called the father of the American constitution, was born in Connecticut in 1725 and died at Philadelphia in 1795. About 1755 he became a successful merchant of Philadelphia, obtaining ample leisure for study and writing. During the Revolution he was thoroughly loyal to the United States, and suffered severely in purse and person. The Continental Congress often consulted him on American currency, finance and resources. After the war he wrote much on finance and economics. Among his writings are *A Dissertation on the Political Union and Constitution of the Thirteen United States* (1783) and *Political Essays on Money* (1791). Madison afterwards mentioned the *Dissertation* as an early and able effort in directing popular thought toward a better form of government, and it contains every essential element of our federal constitution. See *The North American Review*, Aug. 16, 1907, for an eulogy of Webster. His *Essays* remain an authority on the finance of their time.

Wedg'wood, Josi'ah, an English potter, was born at Burslem in Staffordshire, on July 12, 1730. He learned his trade from his father, but was not satisfied with merely carrying it on in the old methods, but made effort toward improvement. He succeeded in producing a cream-colored porcelain which was known as Queen's ware. He extended his improvements also to the form and decoration of his pottery, copying from ancient models and employing Flaxman the sculptor to design for him. He thus raised the rude manufacture of pottery in England to a high position as an art. He built large factories near Burslem for the manufacture of the Wedgwood ware, invented by him in 1775, calling the village Etruria. His liberality and public spirit equaled his wealth, and he was known also as a writer on philosophical subjects. He died on Jan. 3, 1795. Consult *Life* by Meteyard.

Weed, Thur'low, an American journalist, was born at Cairo, N. Y., on Nov. 15, 1797. At ten he was a cabin-boy on a sloop on the Hudson River, and at 12 an apprentice in a printing-office at Catskill, N. Y. He served as a volunteer in the War of 1812. He established *The Agriculturist* in western New York, editing several other journals until he was selected as the editor of *The Albany Journal*, an organ of the Whig party. Here he became an acknowledged leader first of the Whig and then of the Republican party, and had great influence in securing the nominations of Harrison, Taylor and Scott. In 1865 he moved to New York City and became editor of the *New York Times* and afterwards of the *Commercial Advertiser*. He died at New York on Nov. 22, 1882.

Wee'vil, a common name for a number of beetles with long snouts, abundant in the United States, the *Curculios*. The name of weevil is applied also to beetles of the family *Bruchidæ*. Some of the weevils are among the most destructive insects. The plum-weevil, for example, often destroys a large part of that fruit. The female bores a hole in the fruit with her snout, and lays an egg in the cavity; the egg is then pushed to the bottom with the snout. The larva hatches and feeds upon the fruit, which spoils and drops off the tree. The same insect infests cherries, but the wormy cherries hold to the tree. It is also destructive to apricots and peaches. Fortunately, this species is not found on the Pacific coast. The acorn-weevil and the nut-weevil are destructive to acorns, hickory nuts and chestnuts, the snout being in all cases used to make a hole for the eggs. Apple and strawberry weevils attack those fruits, and the latter are especially destructive when they get into a strawberry patch. A large and very destructive member is the Mexican cotton-boll (*q. v.*) weevil, which worked such devastation in Texas a few years ago. The larva, a white maggot, lives on the inner tissue of bolls and buds. The adult weevils feed on tender twigs and leaves. Adults hibernate in rubbish. Remedies recommended are the fall-plowing and burning of infested fields, early planting and cultivation. Stored rice is infested by the rice-weevil, which does a great deal of damage. Peas and beans have been greatly harmed by the pea-weevil, the larva of which bores through the pod and into the pea, feeds industriously here, when full-grown eating a passageway on one side of the pea through which it is to make exit later; in the pea it undergoes transformation, and then emerges as an adult beetle. The larva in feeding avoids the germ of the future sprout, and many peas planted for seed are infested, beetles readily emerging from them. As a rule beetles begin to appear as soon as the peas are in bloom. Certain grain and flour insects are mistakenly called weevils.

Weim'ar (*vī'mär*), a town in Germany, capital of Saxe-Weimar, is 60 miles southwest of Leipsic. It is on Ilm River, in a pleasant valley, but, though a court residence, has little trade and no manufactures. It is celebrated as the home of Goethe, Schiller, Herder and Wieland. The ducal palace has rooms decorated with frescoes illustrating the works of these authors, the public library contains busts of them, and there are a double statue of Goethe and Schiller, one of Herder and one of Wieland; and the tomb of Herder is in the town-church. There are a gymnasium, a free school of design, a public library, a theater, once famous under Goethe's and Schiller's management, and a fine museum. Population 31,117.

Weir (*wēr*), **Robert Walter,** an American painter, was born at New Rochelle, N. Y., June 18, 1803. After studying in Italy for several years he was made professor of drawing at West Point, N. Y., where he remained for 42 years. His best-known works are *The Landing of Henry Hudson; Columbus before the Council of Salamanca; Indian Captives* in the Boston Athenæum; *Embarkation of the Pilgrims* in the rotunda at Washington; and *Christ in the Garden.* Some of his works in private collections at New York are very fine, as a *View of the Hudson from West Point; Rebecca* from *Ivanhoe;* and *A Pier at Venice.* He died at New York on May 1, 1889.

Weismann (*vīs'mān*), **August,** a distinguished German zoölogist, was born at Frankfort-on-the-Main on Jan. 17, 1834, and studied medicine at Göttingen, Paris and Vienna. He early showed a decided fondness for natural science, being specially interested in biology. In 1873 he was appointed professor at Freiburg, and has since devoted himself enthusiastically to research. His writings embrace *Studies in the Theory of Descent, Germ Plasm, Essays on Heredity* and other works bearing on evolution.

Weld'ing, the process by which metals, as iron and platinum, and glass are, when in a fused, plastic, white-hot state, united by hammering and heavy pressing. Car-rails, when laid together, are spliced and clamped by cars going over them fitted with electric current and welding apparatus, after which they are submitted repeatedly to heavy pressure.

Wel'land Canal, one of the most important public works in North America, connects Lake Erie and Lake Ontario. It is 27 miles long. It crosses Welland (or Chippewa) River, a considerable stream, at Welland by an aqueduct built at great expense, the water of the river flowing through arches under the aqueduct. This empties into the Niagara at Chippewa, almost immediately above Niagara Falls.

Welland Canal was the project of William Hamilton Merritt, an enterprising man of affairs residing in St. Catharines, where he had mills. In 1818 he decided to take definite action towards carrying out the project he had conceived years before. Needing water for his mills, he aimed at getting communication with Welland River, and obtained a grant of £2,000 from the government for the cost of surveys. The first survey was inconclusive and unsatisfactory. In 1823 he formed a company with small capital, having decided to push on the work as a private enterprise, and sufficient capital to warrant the commencement of the work was obtained, mainly in New York, and in 1824 the first sod was turned. In 1829 the first two vessels, decorated with flags and cheered by a large gathering of people lining the banks, passed St. Catharines through the canal on their way to Lake Erie. In 1837 an Act of Parliament was passed for the purchase of canal-shares from the shareholders. The government assumed entire control of the canal in 1842 and inaugurated the great work of enlargement and improvement. The first enlargement was completed in 1845. In 1870 the government took steps to make practically a new canal, which would connect with the old one and, when enlarged, would admit the largest vessels navigating the great lakes. This has been finished, and now further deepening and enlargement are contemplated. At present vessels drawing 14 feet of water can pass through. Large ocean-vessels regularly pass through it to ports west. At Port Colborne on Lake Erie, where is the entrance to the canal, a large sum has been expended during the last two years in harbor-improvements and in the erection of an immense grain-elevator. There is a large lock at Port Colborne and no other until you reach Thorold, a distance of about 20 miles. Besides furnishing a great waterway for vessels from Lake Erie to Lake Ontario, the canal provides an inexhaustible supply of water for mills and manufacturing plants. Canada has spent nearly one hundred millions of dollars on her canals, and the end is not yet.

The total number of Canadian vessels which passed through Welland Canal in 1906 was 866 (617 steam, 249 sail); the total number of American vessels was 670 (602 steam, 68 sail). Through St. Lawrence canals in the same year passed 8,213 (4,051 steam) Canadian vessels and 1,258 (869 steam) American vessels. Through Ste. Marie Canal during 1906 the total number of Canadian vessels was 3,922 (3,469 steam) and 1,758 American vessels (1,599 steam).

Welland Canal (enlarged or new line) is 26¾ miles long; has two entrances from Lake Ontario at Port Dalhousie, one for the old, the other for the new canal. From Port Dalhousie to Allanburg, 11¼ miles, there are two distinct lines of canal in operation, the old line and the enlarged or new line. From Allanburg to Port Colborne, 15 miles there is only one channel, the old canal having been enlarged. The canal has two pairs of guard-gates and 26 locks. The locks are 270 feet by 45 feet, the depth of water on the sills being 14 feet. The total rise or lockage is 326¾ feet. The length of the vessels to be accommodated is 255 feet. From the head of Welland Canal there is deep-water navigation through Lake Erie, Detroit River, Lake St. Clair, St. Clair River, Lake Huron and Ste. Mary River to the Sault Canal, — about 580 miles. From the Sault the distance through Lake Superior to Port Arthur is 266 miles and to Duluth 400

miles. (See CORNWALL, LACHINE, MONTREAL, ST. LAWRENCE RIVER and SOULANGES.)

Welland, eight miles from Port Colborne on Lake Erie is on the canal. Its population exceeds 5,000, and it is growing rapidly.

The importance of Canadian waterways in controlling rates of transportation can be easily proved, and will become more apparent as the country west of Lake Superior develops. The returns show that traffic up and down has nearly trebled in 20 years. In the business westward there is a gain of 368 per cent., in that eastward one of 257 per cent. This expansion of business on the canals of Canada is relatively larger than that shown by Canadian railways during the same period. While 57,966,713 tons of freight were carried by Canadian railways in 1906 as compared with 16,356,337 in 1887, the increase was only 254 per cent. as against 287 per cent. on the canals. The trade between lake-ports of the United States by Canadian canals has grown largely since 1887.

Iron ore was the leading commodity making up the traffic through the canals during 1906. The wheat tonnage (46,801,-367 bushels) amounted to 1,406,741, the flour tonnage 297,937 and the corn tonnage 244,122.

No tolls are now collected, the canals having been declared free. The quantity of wheat, corn, oats and other grains which arrived at Montreal, *via* the Grand Trunk and Canadian Pacific railways, in 1906 was 386,963 tons, and the quantity of the same articles which passed down the whole length of the St. Lawrence canals to Montreal the same year was 449,673 tons. The quantity of wheat lightered at Port Colborne in 1907 was 1,009,474 bushels. The total quantity of freight passing through the Welland canal in 1906 was 1,201,967 tons, of which 740,488 tons were agricultural products. There were 979,099 tons of freight passing eastwards and 222,868 passing westwards. Of the eastbound, through freight Canadian vessels carried 488,674 tons and American vessels 480,116 tons; of the westbound, through freight Canadian vessels carried 119,104 tons, and American vessels carried 102,886. On the St. Lawrence canals the total quantity of freight moved was 1,636,117 tons, of which 624,706 were agricultural products, and 595,566 merchandise.

Welland, a Canadian River which flows east 60 miles and empties into the Niagara. It was used as a part of Welland Canal, built to connect Lake Erie and Lake Ontario and to enable vessels to pass around Niagara Falls.

Well-Bor'ing, Drill'ing or **Sink'ing,** a familiar process, which dates from early historic times, for obtaining water. In modern days it is also used for mining purposes or in the search for salt, petroleum or natural gas. The sinking of shafts is also of frequent occurrence for ventilating mines or to obtain a good foundation on which to raise a superstructure of any kind. In the process of shaft or well-sinking a percussion or pounding drill is generally used. If the stratum which has to be cut through is hard rock, then the diamond-drill is employed. Machinery, driven by steampower, furnishes the means of operating the drill or other sinking-gear. The operation is facilitated by the erection of a derrick and its attached power-plant, drilling and hoisting machinery.

Welles (*wĕlz*), **Gid'eon,** American statesman was born at Glastonbury, Conn., on July 1, 1802. He for many years was editor and part proprietor of *The Hartford Times.* While a member of the Connecticut legislature, he secured the abolition of imprisonment for debt. He held a position in the navy department under President Polk, and was made secretary of the navy under President Lincoln, holding the position for eight years. He found the navy at the beginning of the Civil War without a single warship. Yet he succeeded in maintaining a blockade for over 2,000 miles of coast and formed a fleet of ironclads and transports on the Mississippi River. He died at Hartford, Conn., Feb. 11, 1878.

Wellesley (*wĕlz'lĭ*) **College,** an undenominational college founded at Wellesley, Mass., in 1875 for the higher education of women. It has a partly elective course admitting to the degrees of B.A. and M.A., students being admitted either by examination or on certificate from accredited junior schools. The institution offers about 50 undergraduate and 30 graduate scholarships, with studentship in the American schools of classical studies in Athens and Rome and scholarships in the marine biological laboratory at Woods Holl, Mass., and in the zoological station at Naples (*q. v.*). It has over 1,000 students, a faculty of 95 instructors and a library of 60,000 volumes. It has an income of close upon $400,000, with a considerable endowment, besides property and grounds valued at $2,700,000.

Wellesley, Mass., a town in Massachusetts, 14 miles west of Boston, where is situated Wellesley College. It is in Norfolk County and on the Boston and Albany Railroad. Here also are Assumption and St. Joseph Academies (R. C.), Dana and Rock Ridge Halls and Wellesley School. The town owns and operates its waterworks. Population 6,190.

Wellesley, Richard Colley, Marquis of, a British statesman, brother of the duke of Wellington, was born at Dublin, June 20, 1760. He studied at Eton and Oxford, took his seat in the Irish house of peers, and was one of the original Knights of St. Patrick when the order was formed in 1783.

In 1784 he obtained a seat in the British house of commons, and in 1797 entered the house of lords as Baron Wellesley. He was sent to India in 1798 as governor-general, where he found the British possessions threatened by the French in alliance with Tippoo Sahib (*q. v.*), a powerful native prince. He secured the French officers who were over the native troops, sent them out of the country, and defeated Tippoo Sahib, who was slain in battle. He effected a treaty with Persia, and carried on successfully the Mahratta War, which ended by making England the great power in India, adding 40 million people and $50,000,000 of revenue to her kingdom. He built the palace of Calcutta, founded the College of Fort William, and introduced financial reforms that doubled the revenues of the East India Company. The great expense of his administration and charges of cruelty to native princes were the complaints made against him, and articles of impeachment were presented but rejected by the house of commons. He was ambassador to Spain, secretary of state, lord lieutenant of Ireland and lord chamberlain. He had an annuity of $25,000 from the East India Company and a gift of $100,000 toward the close of his life. He died at London, Sept. 26, 1842.

Wel'lington, Arthur Wellesley, Duke of, one of England's greatest generals, was born at Dungan Castle, Ireland, May 1, 1769. He studied in a military college in France. His first actual service was in command of a regiment in the Netherlands in 1794. While his brother was governor of India, he won his first fame in the Mahratta War with the brilliant victory of Assaye, gained with 4,500 men against 40,000 Mahratta troops. After serving in Hannover and Denmark and commanding an expedition sent to Portugal, he was put in command of the peninsular army in Portugal and Spain, which was opposed to the veteran forces of Soult and Victor. He won the battle of Talavera (July 27-28, 1809), for which he was created a peer and given a pension of $10,000. He carried the war into Spain, which was held by the French, gained the battles of Badajos and Salamanca, and was made general-in-chief of the Spanish armies, as he had already been of the Portuguese forces. His pension was doubled, and $500,000 given him to purchase lands. He followed the retreating army into France, took Pamplona, and defeated Soult under the walls of Toulouse. He received for the twelfth time the thanks of Parliament and, also, a gift of $2,000,000. When Napoleon escaped from Elba, Wellington was put in command of the British forces, while the Prussian army was led by Blücher. On June 18, 1815, came the great battle of Waterloo, which finally crushed the power of Napoleon. The allied armies marched upon Paris, and Louis XVIII entered the city the day after the English army. Wellington took command of the army of occupation, living in Paris for three years, where two attempts were made upon his life. He was created field-marshal of the armies of Russia, Prussia and Austria, and prince of Waterloo by the king of the Netherlands, while Parliament added $1,000,000 to its former gift. He represented Great Britain at the congress of Vienna, was sent on an embassy to Russia, and became commander-in-chief of the British army. His political career, during which he filled the first positions in the country, lost him much of his great popularity, as he took a firm stand against reform, his opposition to the reform bill being followed by an attack of a London mob on his house, and hooting and pelting in the streets. His share in the repeal of the corn laws restored the Iron Duke, as the people loved to call him, to popularity. He died at Walmer Castle, Kent, Sept. 14, 1852. Consult *Lives* by Browne, Gleig, Maxwell and Yonge and his own *Dispatches and Memoranda.*

Wellington, New Zealand, a provincial district in, and the seat of the government of, the newly formed Dominion in the southern Pacific. It is situated in the southern part of North Island, the city being on Cook Strait, which separates North and South Islands. It has a fine harbor on an inlet of the strait, and has a large shipping-trade, chiefly exporting wool, frozen meat, *kauri* gum, butter, cheese and gold. The value of the total trade in 1906 was £8,168,443. The area of Wellington District is 11,003 square miles, with a population in 1906 of 179,868, exclusive of the native Maoris; in the same year the city had a population of 58,563 or, with suburbs, 63,807. In the city, besides the Houses of Parliament, Government House and public buildings, are the general post-office, the life-insurance offices, those of the harbor-board, churches, schools and a number of attractive stores. Its industries include potteries, foundries, soap and candle and freezing works, woolen mills, a wax-match factory, several boot and shoe factories and a rope-works.

Wells College. This college for women, which is attended by from one to two hundred women who are candidates for the degrees of bachelor or master of arts, was founded at Aurora, N. Y., by Henry Wells in 1868. The college is undenominational; and has 24 instructors, 169 students and a library of 15,181 volumes. In 1907 the income was $96,169; the productive funds $243,000 and the receipts from benefactions $610,000.

Wells, David Ames, an American economist of note, free trader, lecturer and writer

on economics and political science, was born at Springfield, Mass., June 17, 1828, and died at Norwich, Conn., Nov. 5, 1898. After graduating at Williams College and at Lawrence Scientific School, Harvard, he for a time was associate-editor of *The Springfield Republican*, and took a hearty interest in the publication for a series of years of *The Annual of Scientific Discovery*. In 1866 he was appointed United States commissioner of revenue; in 1877 was chairman of a commission to report upon the laws relating to taxation in the state of New York; and generally took a prominent part in discussions of the time on financial and economic subjects. He was an industrious and prolific writer. Among his published works are textbooks on *Familiar Science*, *Science of Common Things*, *Elements of Natural Philosophy*, *First Principles of Geology*, *Production and Distribution of Wealth*, *Practical Economics*, *The Relation of the Tariff to Wages*, *Recent Economic Changes* and *The Principles of Taxation*. He also published *Robinson Crusoe's Money* and *Our Merchant-Marine*.

Wells'ton, Ohio, a city in Jackson County, on the Baltimore and Ohio Southwestern, Cincinnati, Hamilton and Dayton, Detroit Southern and Hocking Valley railroads, about 75 miles south-southeast of Columbus. Settled about 1871, it was incorporated in 1876. Besides its public buildings it has a fine park (Lake Alma), and is the seat of Hoy Hospital. It is in a coal and iron mining region, its chief industries (besides the manufacture of cement) being a foundry, barrel-factory and blast-furnaces. The city owns its waterworks and its electric-light plant. Population 10,247.

We'ner or **Vener, Lake.** See SWEDEN.

Weser (*vā'zĕr*), one of the chief rivers of Germany, flows through Prussia and empties into the North Sea. It is 260 miles long, but of little use for navigation.

Wes'ley, Charles, was born at Epworth, in Lincolnshire, England, Dec. 18, 1708. The name is thought to be the same as Wellesley, and Garrett Wellesley offered to make Charles Wesley his heir if he would settle in Ireland, but the offer was declined, and the estate went to another branch of the family, from which came Arthur Wellesley, Duke of Wellington. Charles Wesley, after studying at Oxford, went to Georgia with his brother John. On his return to England he took an active part in the work of forming the Methodist church. He is especially known as a hymn-writer, some of the most beautiful hymns in collections of hymns being his work. *Jesus, Thy Robe of Righteousness* and *Blow Ye the Trumpet, Blow* are among the best known of his large contributions to the music of the church, which numbered 4,100 published hymns and 2,000 in manuscript. He died at London, March 29, 1788. Consult *Life* by Jackson and that by Telford and Julian's *Dictionary of Hymnology*.

Wesley, John, the founder of Methodism, was born at Epworth, in Lincolnshire, England, June 17, 1703. He was made a fellow in Lincoln College, Oxford, where, with his brother Charles and a few others, he began a systematic course of religious exercises that gave them the name of Methodists. In 1735 he went to Georgia as preacher to the colonists and missionary to the Indians, and became impressed with the views of the Moravians who were his fellow-passengers at sea. After two years he returned to England. Here he studied the Moravian doctrines, and ascribed his conversion to a Moravian meeting in London. He began his preaching in London, and soon joined George Whitefield in open-air services, sometimes delivering 800 sermons a year. The meetings were attended by thousands, especially in the mining and manufacturing districts. Persecution and opposition resulted in Wesley's forming bands for prayer and a church-society and, finally, in his ordaining preachers to be sent to America, Scotland and other places, thus separating entirely from the Church of England. He traveled nearly 270,000 miles, usually on horseback, and preached over 40,000 sermons, He wrote a large number of volumes on religious subjects, and with Charles, his brother, published a collection of hymns. He died at London, March 2, 1791. See *Lives* by Southey, Watson and Moore and *History of the Religious Movement of the 18th Century* by Stevens.

Wes'leyan Univer'sity, at Middletown, Conn., was founded in 1831, and is the oldest of the colleges established under the auspices of the Methodist Episcopal church in the United States. It has 35 instructors, 340 students and a library of 16,000 volumes. Benefactions in 1907 were $77,891; income $185,960; and productive funds $1,522,521.

West Bay City. See BAY CITY.

West, Benjamin, an American painter, was born at Springfield, Pa., Oct. 10, 1738. His first portrait was a picture of his baby-sister, smiling in her sleep, made when he was only seven. His colors were made from berries, and his brush was of hairs stolen from the cat's tail. His first work was done at Philadelphia and New York, but in 1760 he went to Italy for further study, and after three years of training settled in London. Here he became famous at once, and was appointed historical painter by George III. He was one of the four artists who formed the Royal Academy, and was chosen to succeed Sir Joshua Reynolds as its president. His paintings mostly were on historical and religious subjects, on a large scale, in imitation of the old masters. The *Death of Wolfe*, the *Battle of*

La Hogue and *Christ Healing the Sick* are among his best paintings, of which he left nearly 400. He died in 1820, and was buried in St. Paul's, London. Consult Cunningham's *Lives of Eminent Painters* and Redgrave's *Century of Painters of the English School.*

West Ches'ter, Pa., a borough, the seat of Chester County, on the Pennsylvania and Philadelphia, Baltimore and Washington railways, 24 miles west of Philadelphia. It was settled, incorporated as a town, and later became a borough, about the close of the 18th century. Its institutions (besides the county court-house, jail and municipal buildings) embrace Chester County Hospital, State Normal School, seminaries, schools, churches and a public library, in addition to two attractive parks. Near by is the battlefield of the Brandywine (*q. v.*), and the region is noted for its market gardening and dairying interests. Its industries include dairying implements, cream-separators, planing-mills, machine-shops, a tag-factory, grain-elevators and wheel-works. Population 10,424.

West'cott, Brooke Foss, an English prelate, writer and biblical scholar, was born near Birmingham in 1825, and educated at Trinity College, Cambridge. He successively was a master at Harrow, canon of Peterborough, regius professor of divinity at Cambridge and canon of Westminster, and in 1890 was appointed bishop of Durham. He interested himself in the miners there, gained their trust, and settled and prevented difficulties between them and the mine-owners. He stood well up among scholars and theologians. With F. A. Hort he spent 28 years in ascertaining the true text of the Greek New Testament. Their text is considered authoritative and almost final, and forms the basis of the revised version in English, of which also he was one of the makers (1874-81). He is one of the glories of the church universal. His writings are numerous, embracing a *History of the Canon of the New Testament, Introduction to the Study of the Gospels, History of the English Bible, The Gospel of the Resurrection, The Gospel of Life, Social Aspects of Christianity, The Historic Faith, The Revelation of the Risen Lord* and *Characteristics of the Gospel Miracles.* He died on July 27, 1901.

West'erly, R. I., a town embracing a group of villages in Washington County on Pawcatuck River and the New York, New Haven and Hartford Railroad, 42 miles southwest of Providence. Settled and incorporated in the latter half of the 17th century, it has become the center of farming interests, manufacturing and considerable granite-quarrying. Its manufactures embrace printing-presses, woolen and cotton goods and thread. Wilcox Park is an attaractive local resort, as is also Watch Hill in summer, where there is good bathing on the shore of Long Island Sound. Population 7,541.

Western, The, a college for women located at Oxford, O., was established in 1853, as The Western Female Seminary. In 1894 the name was changed to The Western, a college and seminary for women. It has 27 instructors, 245 students and a library of 13,143 volumes. See OXFORD, O.

Western Austral'ia forms about a third of Australia (*q. v.*), and is 1,400 miles long and 850 broad, covering 975,920 square miles, with a coast of 3,500 miles. The Murray, Blackstone, Swan and Murchison, 400 miles long, the Fitzroy and the Ord are some of the principal rivers. The country is mostly level, covered with forests, with a dry, sandy region in the interior and a few, shallow, salt lakes. The Darling, Victoria and Herschel are the principal mountain-ranges — not over 3,000 feet high. The eucalyptus, mahogany, red gum, York gum, jarrah, baobab, sandalwood, grass-tree, paper-bark tree and mangrove are some of the peculiar trees; while the kangaroo, wombat, wallaby and dingo or wild dog are found among the animals. The raising of sheep, goats and cattle is the most important industry; the fisheries, including turtle, rock-cod and snapper, provide material for the canneries; and the pearl-fisheries are increasing in value; salt, raisins, castor-oil, honey, wax, manna, gums and wine are other products. Gold is found in Kimberley; magnetic iron ore at Mt. Magnet; lead and copper in the Victoria region, besides silver and plumbago. In 1906-7 the government expended £169,753 on its schools. There were 376 public schools, with 28,927 pupils in attendance and 108 private schools with 7,515 pupils. There were 1,990 miles of railway and 10,000 miles of telegraph. Western Australia is a British state, first settled by a convict-colony at Port Jackson, but it made little growth until convict-labor was introduced. From 1850 to 1868, 10,000 convicts were brought into the country. The capital is Perth (population 50,527). Population of the state 184,124.

West'field, Mass., a town, consisting of a group of early settled villages, in Hampden County, on Westfield River and on the Boston and Albany and New York, New Haven and Hartford railroads, nine miles west of Springfield. Its institutions include a state normal school, Noble Hospital and Westfield Athenæum. The town owns and operates its own waterworks, gas and electric-light plant, and has an attractive resort in Woronoco Park. Its industries embrace the manufacture of bicycles, radiators, boilers, cigars, driving-whips, organs, thread and boxes. It also has paper-mills, brick-yards and machine-shops. Population 13,871.

West Ho'boken, N. J., a flourishing town in Hudson County, N. J., on the Hudson River, adjacent to New York City. It is largely engaged in the manufacture of silk-goods. It has schools, churches and civic buildings, a convent of the Sisters of St. Dominic, a Roman Catholic school and a monastery of the Passionist Fathers. The population has more than doubled in the past decade, its inhabitants now numbering 26,523.

West In'dies, an archipelago of about 1,000 islands lying between North and South America. The island of Guanahani was the first land seen by Columbus, and he gave the name of West Indies to the region, thinking he had found a new route to India. The islands separate the Atlantic Ocean from the Gulf of Mexico, and are in four groups: the Bahamas; the Greater Antilles, including Cuba, Haiti, Jamaica and Porto Rico; the Lesser Antilles; and the islands off the coast of Venezuela. The Bahamas are low islands of coral, while the other Antilles are mountainous and volcanic, having peaks from 6,000 to 8,000 feet high. The summers are very hot, and hurricanes are numerous and severe. Insects, snakes, lizards and scorpions abound, and the birds are especially beautiful. The forests produce mahogany, satinwood, crabwood, rosewood and other valuable lumber. Ginger, pepper, pimento, aloes, sassafras, cochineal and indigo are other products. The chief trade is in sugar and tobacco. The mineral wealth is not great, though gold, silver, iron, copper, tin, lead, salt and other minerals are found and worked to some degree. The Spaniards began their dominion over the islands by enslaving the native tribes they found there, who at times revolted against their masters, but with no effect, and were almost exterminated. As a result of the Spanish-American war in 1898 Porto Rico was ceded to the United States and Cuba was freed from Spanish sovereignty. Guadaloupe, St. Bartholomew and Martinique belong to France; the Bahamas, Jamaica, the Leeward and the Windward Islands and Trinidad to England; some of the smaller islands to the Dutch; some to the Danes; while Haiti is independent. Population (total estimated of the whole of the West Indies) 5,678,128.

Wes'tinghouse', George, American engineer and inventor of the air-brake, was born at Central Bridge in Schoharie County, N. Y., on Oct. 6, 1846, and spent his early youth as apprentice in his father's machine-shops at Schenectady, where he was also educated in the public schools of the town. In the Civil War he served for two or three years with the 12th New York Regiment and the New York Cavalry Corps, and later became assistant-engineer in the United States navy. Returning to Schenectady in 1865, he resumed his education at Union College, meanwhile pursuing his bent towards mechanical investigation. The result was his invention of the locomotive air-brake, which came into instant use in this country and, later, in Europe. For this and for his other useful mechanical devices and patents he received honors abroad. He also devoted himself to electrical research and made such discoveries or developments of discoveries as to make possible the long-distance transmission of power. Connecting himself with a large manufacturing plant at Pittsburgh, Pa., he gave practical effect on a large scale to his inventions and mechanical appliances, turning out steam and gas engines, steam turbines etc., and also supplying the generators for use in the large power-plants at Niagara Falls and those in use by the rapid transit and elevator systems of New York and elsewhere.

West'minster Abbey is in the city of Westminster, which now is a part of London. On an island formed by a branch of the Thames, Sebert, king of the East Saxons, built a church in the 7th century, which was replaced, it is thought, by an abbey called Westminster, to distinguish it from St. Paul's or Eastminster. The first building of stone on the site was built by Edward the Confessor, of which the pyx-house is a remnant. The present abbey was mostly built by Henry III, beginning in 1220 with a chapel. The western front with its great window was the work of Richard III and Henry VII, who also built the chapel called by his name. Two towers were added by Sir Christopher Wren. The building is a cross, 511 feet long. It was used as the burying-place of the English kings, and is crowded with monuments. The shrine of Edward the Confessor was built by Henry III; the tombs of Edward I, Henry III, Henry V, Edward III and of most of the sovereigns from Henry VII to George III are within the walls. There are, besides, the two coronation-chairs, one inclosing the stone brought by Edward I from Scone, on which the Scottish kings were crowned. The most interesting part of the abbey is the Poets' Corner in the eastern aisle of the southern transept, where are memorials of the great British poets, Chaucer, Dryden, Milton, Gray, Shakespeare, Addison, Thomson, Tennyson and the American poet, Longfellow. The monuments of Pitt, Fox, Chatham, Canning and Wilberforce and of the great inventors, Talford, Watt and Stephenson are in other parts of the building. Consult Walcott's *Memorials of Westminster.*

Westminister, Can. One of the richest agricultural districts of British Columbia is New Westminister, which includes all the fertile valley of the lower Fraser. The climate is mild, with much rain in winter. The timber is heavy, the underbrush thick.

Westminister is the center of the great lumbering and salmon-canning industries. Its agricultural advantages are unexcelled in the province, heavy crops of grain, hay and roots being the rule, and fruit growing to perfection and in profusion. A great deal of the land in Fraser Valley has been reclaimed by dyking.

Westpha'lia, a province in western Prussia, bordering on Holland. It is 110 miles long and 124 wide, covering 7,803 square miles. The Lippe, Ruhr, Ems and Weser are the principal rivers, the Weser crossing Weser Hills by a pass called the Westphalian Gate. The Lippe divides the country into two parts, the northern portion flat like Holland and the southern portion having hills and valleys. The farming is carried on by small farmers with old methods, the most important crops being hemp and flax. Cattle, goats and hogs are raised, the latter yielding the well-known Westphalian hams. Mineral resources give great prosperity. There are large coal-fields in the north, and it produces more iron-ore than any other province of Prussia except Silesia. It also is rich in copper, zinc, sulphur and salt. The leading manufactures are linen-weaving and iron-working. Westphalia was the name of the western part of the duchy of Saxony. It was divided when Henry the Lion's Saxon domains were distributed by Emperor Maximilian, the archbishops of Cologne receiving a part, with the title of dukes of Westphalia. Napoleon formed the kingdom of Westphalia for Jerome, his brother, which was abolished after the battle of Leipsic. The congress of Vienna (1815) finally gave Westphalia to Prussia. The peace of Westphalia at Osnabrück and Münster, in 1648, ended the Thirty Years' War. Population 3,618,090.

West Point, N. Y., the seat of the United States Military Academy, is a village of Orange County on Hudson River, 52 miles north of New York City. It is a promontory about 180 feet above the river, commanding the fine scenery of the Highlands and surrounded by hills reaching from 500 to 1,500 feet in height. The military school was founded in 1802, and provides free education for 300 cadets, who are bound to serve in the army (*q. v.*) for eight years. Each congressional district can send one cadet and ten are appointed by the president. The course of training lasts four years, and the graduates have the rank of second lieutenant in the regular army. The buildings include several batteries, besides the library, stone barracks and buildings for instruction, and contain many war relics and portraits of military heroes. West Point was guarded during the Revolutionary War by two forts and a chain across the river, which were taken by the British in 1777, but abandoned by them after Burgoyne's surrender. The point was afterwards strengthened by forts and other works, which Benedict Arnold, the commander, was bargaining to betray to the British, when the arrest of Major André (*q. v.*) defeated the plot. See MILITARY SCHOOLS.

West Spring'field, Mass., a town consisting of a cluster of villages on Connecticut River, in Hampden County, opposite Springfield and on the Boston and Albany Railroad. Settled about the middle of the 17th century as part of Springfield, it was separately incorporated in 1774, and has become an attractive place of residence for the people of Springfield. It owns its own waterworks, and here are the repair-shops of the Boston and Maine Railroad; here also is a well-equipped public library, besides good schools and churches. Its industries include the manufacture of paper, cotton-cloth and cigars. Population 7,105.

West Virgin'ia, one of the central states of the Union, lies mostly between Virginia and Ohio River, with the narrow strip, called the Panhandle, running for 60 miles between Ohio and Pennsylvania.

Area and Surface. It covers 24,645 square miles, nearly all of it being mountainous or hilly, which has given it the name of the Switzerland of America. The Alleghany Mountains are on the eastern border, and in the western part of the state are Laurel Hill, Greenbrier, Gauley and Rich Mountains, a continuation of the Cumberland range. The Potomac forms 100 miles of the northern boundary and the Ohio 300 miles of the western border, with the Monongahela, Great and Little Kanawhas and the Big Sandy flowing into it. The Kanawha is 450 miles long and is navigable for 100 miles. Nearly all the lower hill-country can be cultivated, and in the mountainous regions are broad, fertile valleys.

Resources. There still are a few large tracts of timber, though these are rapidly disappearing by reason of the extensive production of lumber and numerous wood-working industries. The coal-fields cover 16,000 square miles, a larger extent of country than Great Britain's and give the state the fourth place in the coal-states, while it is second in producing coal and coke. Petroleum, natural gas, iron-ore, salt, bromine, sandstone, marble, alum and copper are other minerals found very abundantly. The mineral springs, as Greenbrier, White Sulphur Springs (used by the Shawnee Indians and early white settlers), Berkeley Springs, Red Sulphur Springs, Old Sweet and Capon Springs, are famous summer-resorts. Corn is the largest crop, followed by wheat, oats and tobacco. The raising of horses, sheep and cattle is a large industry; the great lumber business, with tanneries and wood-pulp mills in connection with it, and coal-mining are other industries. The manufactures are those of leather, iron, steel, glass and pottery.

Education. There are 6,342 school-buildings in the state. The elementary schools have 8,063 teachers and an enrollment of 255,160 pupils. The *per capita* expenditure for their education is $12.02. The state supports a university with 14 different schools and colleges, six normal schools, two preparatory schools for the state's university, a school for the deaf and the blind, a reform school for boys and an industrial school for girls. There are about 30 colleges and academies under church and private control. The most important are Bethany College, founded by Alexander Campbell, organizer of the Disciples of Christ; West Virginia Wesleyan College, a coëducational institution founded by West Virginia Conference of the Methodist Episcopal Church; Morris-Harvey College, founded by the Methodist Episcopal Church South; and Davis and Elkins College, an institution under the control of Winchester Presbytery of the Presbyterian Church South.

History. The first permanent settlers in West Virginia came from east of the Alleghanies, and one of the first landowners was George Washington, who held 32,000 acres in the Ohio and Kanawha valleys. When Virginia seceded, the western part, separated from the eastern part by the Alleghany Mountains and closely connected with Ohio, refused to join the movement, held conventions at Clarksburg and Wheeling, and formed West Virginia, which was admitted into the Union in 1863. John Brown's raid on Harper's Ferry and the battles of Philippi, Beverly, Rich Mountain, Cheat Mountain and Carnifex Ferry were the chief actions on the soil of West Virginia connected with the Civil War. The chief city is Wheeling (population 41,494). The population of the state is 1,056,805.

West Virginia Univer'sity, located at Morgantown, was founded in 1867 as West Virginia Agricultural College. In 1868, by act of legislature, the name was changed to West Virginia University. The organization includes colleges of art and sciences, engineering and mechanic arts, agriculture, school of music and commercial and preparatory schools. The faculty numbers 80, the students 1534 and the library 25,000 volumes. In 1907 the income was $224,353.

Wet'terhorn, a lofty mountain in Switzerland, about ten miles from Lake Brienz. It rises almost perpendicularly in one great wall of limestone, 12,200 or 14,105 feet, according to different measurements.

Wey'man, Stanley John, English novelist, was born at Ludlow, Shropshire on Aug. 7, 1855, and educated at Shrewsbury School and Christ Church, Oxford. Studying law, he was called to the bar and practiced on circuit from 1881 to 1889, when his first work, *The House of the Wolf* — a romance of French history — appeared. After this his health necessitated travel abroad, and he abandoned law altogether. His more notable novels include *The New Rector, The Story of Francis Cludde* and *A Gentleman of France.* The success of the latter, which was published in 1893 and at once translated into many European languages, was immediate, and it has proved one of the most successful of recent historical romances. His later stories are *Under the Red Robe, My Lady Rotha, The Red Cockade, The Man in Black, The Castle Inn, The Long Night, Stane Crow Farm, The Abbess of Vlaye, In King's Byways, Shrewsbury* and the *Memoirs of a Minister of France.* He is a vivid and picturesque writer, and has been most successful in his treatment of themes drawn chiefly from the era of medieval France.

Wey'mouth, Mass., a town embracing a number of villages with an early historic interest, in Norfolk County, on Weymouth Fore River and the New York, New Haven and Hartford Railroad, 12 miles southeast of Boston. The town dates from the era of the Plymouth colonists, when it was known by its Indian name of Wessagusset. Its industrial interests are connected with the manufacture of shoes, with woolscouring and with nail, coal and lumber works. It has two local libraries, the Tuff and the Fogg, besides churches, elementary and high schools, several banks and a weekly newspaper. Population 11,637.

Whale, a marine mammal of fish-like form belonging to the order *Cetacea.* The dolphins are included with the whales. Few people realize what the term, a marine mammal, means as applied to whales, the fish-like form suggesting an affinity with fishes; but they are warm-blooded animals, breathing by lungs and suckling their young with milk — in short, ranking above reptiles and birds and in the class of *Mammalia.*

SPERM-WHALE

There are two divisions, those with teeth, as the dolphin and the sperm-whale, and those without teeth in the adult but with plates of whalebone inside the mouth. The latter group, often called the true whales, have teeth in embryonic stages, and the fact that teeth arise and disappear before birth is taken to mean that the whalebone whales are descended from ancestors which had teeth and that the embryonic teeth

are a matter of inheritance, but in the changed habits of the animal are not required. The whales have nostrils on the top of the head, and in coming to the surface they spout or blow. They do not, however, as is generally supposed, throw out a jet of water. The column of spray is due to the condensing of their warm breath, which is laden with watery vapor. The head, which in some species may make one third the length of the entire animal, merges into the body without a perceptible neck. The fore limbs are modified into paddles, but, internally, they show bones corresponding to those in the arm of man, not to those in the fins of fishes. The hind limbs are absent, but there is a distinct trace of the hip-bones. The tail is expanded horizontally, not vertically as in the fishes. Most warm-blooded animals are kept warm by a hairy covering; the whales, however, are almost destitute of hair; but the body is surrounded by a very thick layer of fat or blubber under the skin to keep up the temperature. The whales wander over a wide part of the ocean, being found in tropical, temperate and frigid seas. Their food is varied, that of the sperm-whales being partly made of large cuttle-fish. The ambergris of commerce is derived from an internal secretion coming from these whales and containing the hard beaks of cuttlefish. The large whalebone whales feed on small crustacea, squids, fish and the like. They swim with their mouths open. When a number of these small creatures are collected within the mouth, it is closed and the water is strained through the plates of whalebones, while the animals are retained.

The rorquals, from 65 to 75 feet long, are among the most abundant whales. The finback whale, about 60 feet long, is found along the coast of the eastern United States and is sometimes seen in Massachusetts Bay. Another common whale of our eastern Atlantic coast is the black or right whale, about 40 feet long. It is occasionally found as far south as South Carolina. In the Arctic region is found the great bowhead, the most valuable of whales to the whale hunters, but not the largest one. It reaches a length of 50 to 60 feet, but an adult will yield from 200 to 300 barrels of oil and two tons of whalebone. The largest whale is the sulphur bottom of the Pacific, which reaches 100 feet in length, and is the largest of living animals and, probably, of all animals that have ever lived. The razorback of the northern Atlantic grows to be 70 feet in length. The sperm-whale or cachalot is a toothed whale, which attains a length of 80 feet. It inhabits the open sea, especially in southern latitudes. It yields the fine sperm-oil and spermaceti. The chase of these monsters of the ocean has greatly declined, largely on account of their growing scarcity and the abundance of other oils. Formerly New Bedford and San Francisco were the principal whaling-ports of the United States.

Whaleback Boats. This form of steam-vessel was developed on the great lakes of America between 1875 and 1880. The idea was to build a vessel of steel with top-sides and erections rounded in such form as to reduce the resistance both to wind and water to a minimum. The name was given because of the resemblance of that portion of the vessel which is visible when afloat to the back of a whale. The first whaleback barge was built of 437 tons' registry, 1,400 tons' capacity. Whalebacks are in use on the Atlantic coast. The *Chas. W. Whitmore*, 3,000 tons, made the voyage to Liverpool in 1891. The shape of these vessels makes them particularly steady at sea. The poor accommodation for the crew on long voyages has prevented its general adoption in traffic on the ocean.

Whate'ly, Richard, a British theologian, was born at London, Feb. 1, 1787. He studied at Oxford with honor, and remained there as tutor and afterward as Bampton lecturer. After having charge of a parish for two years, he returned to Oxford as principal of St. Alban's Hall, and later was made professor of political economy. His appointment soon after as archbishop of Dublin, "a call to the helm of a crazy ship in a storm" as he called it, gave him work of a different kind, but he endowed the chair of political economy in Trinity College. During the Irish famine he was unwearied in his efforts to help his people, and his charities always were on a large scale. His treatises on *Logic*, *Rhetoric* and *Christian Evidences*, his best-known works, were long used as textbooks. His *Historic Doubts Relative to Napoleon* is also famous. A daughter of his did noble service as a missionary among the Muslim women of Egypt. He died on Oct. 8, 1863. Consult *Life and Correspondence* by his daughter and *Memoirs* by W. J. Fitzpatrick.

Wheat, a species of *Triticum* (*T. sativum*), a genus of the grass family. It is not known in the wild state, but its original home is believed to have been in western Asia. It has been under cultivation throughout the entire time covered by human records. Spelt is a kind of wheat cultivated in some parts of Europe, in which the chaff adheres firmly to the grain, as in barley. In the wheat of ordinary cultivation, however, the chaff is easily removed by threshing. The numerous varieties are variously known as spring and winter wheat, bearded and beardless wheat etc. Spring wheat is sown in early spring; winter wheat in the autumn. Wheat is one of the most valuable of cereals, and is the source of all the common white flour of the United States. In 1906 the wheat crop of the world amounted

to 3,423,134,000 bushels, the United States leading with its production of 735,261,000 bushels. In the same year the seven states showing the largest yield were Kansas (81,830,611 bushels); North Dakota (77,896,000); Minnesota (55,801,591); Nebraska (52,288,692); Indiana (48,080,925); Ohio (43,202,100); and South Dakota(41,955,400).

Wheat'stone, Sir **Charles,** an English inventor and scholar, was born at Gloucester in February, 1802. He began making musical instruments, and made many experiments in sound, inventing an instrument that was played by a piano in another room and so seemed to play itself. His first paper was *New Experiments in Sound.* He extended his studies to light and electricity, invented a number of instruments, and with Cooke took out a patent for an electric telegraph in 1837. He invented the stereoscope, the cryptograph and a telegraphic barometer and thermometer, by which an observer at the foot of a mountain could read the instruments at the top. Scarcely a year passed without a paper from him on some difficult scientific subject or without an invention. He was made professor in King's College, London, a fellow of the Royal Society, a member of all the leading foreign scientific associations, and, after the completion of his automatic telegraph, was knighted. He died at Paris, while perfecting an instrument for submarine cables, Oct. 19, 1875.

Wheatstone's Bridge, a piece of electrical apparatus devised by Sir Charles Wheatstone for measuring the electrical resistance of a conductor. It consists of a network of six wires arranged as shown in the accompanying diagram. Four resistances: R, R_1, R_2 and X, are so joined in series as to form a closed circuit. In this circuit there will always be four junctions, namely, A, D, B and F. The next step in manufacturing a Wheatstone's bridge is to join a battery across two diagonally opposite junctions, say A and B, as shown in the

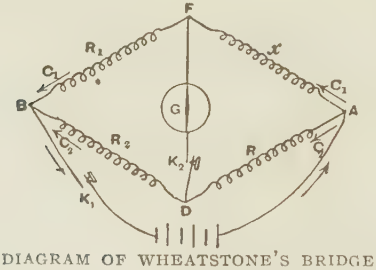


DIAGRAM OF WHEATSTONE'S BRIDGE

diagram. The current entering at A divides into two parts, one flowing along the branches X and R_1, the other flowing along the branches R and R_2.

Next join the remaining two junctions, F and D, by a circuit containing a galvanometer. In general, the potential at F and the potential at D will be different; but by diminishing the resistance in R and increasing the resistance in R_2, or *vice versa*, we can easily make the potentials at F and D the same. When this adjustment is reached, there will be no current flowing through the galvanometer G, even if the key K_2 be closed. Let us now call the fall in potential between A and F (and hence also between A and D) E_1; and the fall in potential between F and B we shall denote by E_2. Then, by Ohm's law, we may write

$$\frac{E_1}{X} = \frac{E_2}{R_1} \text{ and } \frac{E_1}{R} = \frac{E_2}{R_2}.$$

Dividing one of these equations by the other, we have

$$X = \left(\frac{R_1}{R_2}\right)R.$$

Accordingly, if we know the value of one resistance R and the ratio of the other two, R_1 and R_2, we can at once obtain the value of the unknown resistance X. This is the purpose of the Wheatstone bridge. Consult any good textbook of physics for a discussion of this subject.

Wheel, a piece of wood or metal, usually round and either solid or open, fastened to a center piece, around which it turns. The center-piece is called an axle when the wheel turns on it, and an arbor or shaft when the wheel turns with it. Wheels are used to produce motion and are of different kinds, as wagon-wheels, water-wheels, car-wheels, steamboat-wheels, fly-wheels, balance-wheels, crown-wheels, spur-wheels, band- or belt-wheels, ratchet-wheels, cog-wheels and pinions, the kinds used in machinery. Carriage and wagon wheels are made of wood with a band of iron; car-wheels and machinery-wheels of iron, though sometimes of wood or brass; and clock and watch wheels of brass also. Carriage and wagon wheels are made with a central hub of wood, which turns on an axle, from which spokes radiate to the wooden rim of the wheel. An iron tire or hoop, heated hot, so that it expands, is fastened on the rim, and as it cools it tightens, connecting the parts very firmly. Car-wheels are made either of iron or steel, or iron and steel, or of iron, steel and wood combined, and usually are solid, with the edge or rim fitted to the rail. Water-wheels (*q. v.*) are used for turning machinery by water. The overshot wheel has boxes or buckets on the rim. The buckets on one side fill with water and their weight makes the wheel turn, the buckets emptying themselves as they reach the bottom. The undershot wheel has flat boards, called floats, instead of buckets, and is used where there is plenty of water. The turbine-wheel is

one that works flat instead of up and down. In machinery the sets of wheels are joined by bands or belts, or work by cogs or teeth. See CLOCK, STEAMBOAT and WATCH.

Wheel'er, Benjamin Ide, president of the University of California since July 18, 1899, was born in Randolph, Mass., July 15, 1854. He graduated from Brown University in 1875. He received his A.M. in 1878; his Ph.D. from Heidelberg in 1885; and honorary LL.D from Harvard in 1900, Brown 1900, Yale 1901, Johns Hopkins 1902, Wisconsin 1904 and Columbia 1905. He was instructor at Brown University during 1879–81; and at Harvard in 1885–6. He became professor of comparative philology at Cornell in 1886 and at the American School of Classical Studies in Athens, Greece, in 1896. He is corresponding member of the *Kaiserliches Archæologisches Institut.* He is author of *The Greek Noun-Accent; Analogy in Language; Introduction to the History of Language; Dionysos and Immortality; Organization of Higher Education in the United States;* and *Life of Alexander the Great.* He was editor of the department of philology in *Johnson's Universal Cyclopedia* and in Macmillan's *Dictionary of Philosophy and Psychology.*

Wheeler, Joseph, American soldier, a distinguished cavalry general of the Confederate army and in command of the cavalry division of the United States army of Santiago in the war with Spain, was born at Augusta, Ga., Sept. 10, 1836, and graduated at West Point in 1859. In April, 1861, he entered the Confederate army, and by the close of that year he rose to the rank of brigadier and later to that of major-general and lieutenant-general. He was at Shiloh, served under Bragg in the west, distinguished himself at Chickamauga, and opposed Sherman in his march through Georgia and South Carolina. During the war he was thrice wounded and had 16 horses shot under him. In 1869 he settled at Wheeler, Ala., where he became a planter and lawyer, and in 1880 was returned to Congress as a Democrat from Alabama, and served continuously until May, 1898, when he became major-general of volunteers, and was assigned to the command of the cavalry division in the army of Santiago. He was present at the battles of Las Guasimas and San Juan Hill, and was the senior member of the commission to arrange for the surrender of Santiago de Cuba. During 1899 General Wheeler was on service in the Philippines, and in August, 1900, he retired from the army, having reached the age-limit. He died on Jan. 25, 1906.

GENERAL WHEELER

Wheeler, William Almon, nineteenth vice-president of the United States, was born at Malone, N. Y., on June 30, 1819. He began his political career as a state senator in 1858. In 1860 he was in Congress, and again during 1866–77. The compromise which allayed the disturbed condition of politics in Louisiana in 1874 was largely his work, and he was also foremost in returning his back-pay to the national treasury when the act increasing the salary of congressmen was passed. He was elected to the vice-presidency in 1876, when Hayes was president. He died on June 4, 1887.

Wheel'ing, W. Va., county-seat of Ohio County, in the narrow strip known as the Panhandle, on Ohio River. Part of the city is built on an island in the river, connected with the mainland by a suspension bridge. It has the capitol building, used for governmental purposes while it was the capital of West Virginia, postoffice, custom-house, public library, opera-house and other fine buildings. It is chiefly known as a manufacturing city, the coal in the region furnishing an abundance of cheap fuel as well as natural gas, which is used in many factories. There are blast-furnaces, iron-foundries and forges, manufactories of mowing and reaping machines, steam-engines, wagons, carriages, nails, leather, paper, extensive glass-factories, potteries and cigar-factories. It was the capital of West Virginia until 1870 and in 1875. Population 45,000.

Whelk, the name for marine gasteropod mollusks belonging especially to the family of *Buccinidæ.* The common whelk of the northern Atlantic is eaten in England. These animals look somewhat like very large snails. The shell is pointed, but has only a few whorls. The animal has a broad body, with tentacles projecting from the head. It can be entirely retracted within its shell. It burrows in the sand, and feeds on clams and other bivalve mollusks. Some whelks are used for bait.

Whig Party, The. (1) In British history one of the two political parties in the state, of an advanced and reforming character, now known as Liberals. The term had its origin in the middle of the 17th century and was applied to the Scotch Presbyterians (Covenanters as opposed to the Cavaliers), who had rebelled against the crown; and thus the appellation was at first regarded as a contemptuous epithet, hurled at them by the Tory party — the organization opposed to them in the state and favoring monarchy and conservative rule. The Whigs may be said to be the successors of the Cromwellian Roundheads, whose liberal principles led them to favor and defend the Revolution of 1688, insist upon parliamentary control of the government, and

desire the Hanoverian rather than the Stuart rule. The influence of the party became powerful in the state from the era of George I, and was represented by the great Whig families of the time — Burke and Fox being its chief leaders. After the era of the Reform Bill (1832), a piece of legislation brought about by the Whigs, the latter term began to be replaced by that of the progressive and reforming Liberals. Goldwin Smith (*q. v.*) thus defines the two party names: "The Tory was the friend of government by prerogative and of church privilege; the Whig was the friend of constitutional liberty and toleration; in effect, the Tory was a supporter of monarchical, the Whig of parliamentary, supremacy. . . . In later times the Tory party became that of political and ecclesiastical reaction, the Whig party that of general progress."

(2) In American history the Whigs of the days of the American colonies were those who favored the Revolution, as opposed to the Tories, who advocated adherence to the mother country. The term more specifically dates, however, from 1830 and refers to the political party under the leadership of Henry Clay, known as National Republicans (or Whigs), as opposed to the Jackson, and later to the Democratic, Republicans. The Whigs favored a protective tariff, a national bank and a system of internal improvements. It was they who in 1840 elected W. H. Harrison to the presidency, and sought in 1844 to elect Clay to the office. With the election of Zachary Taylor the Whig party fell into a state of disintegration, many of the northern Whigs becoming Free Soilers and most southern Whigs becoming Democrats. The Whigs had a long line of representative leaders in the north; but the term fell into disuse, or, more correctly, gave place to that of Republicans — the last action of what remained of the Whig party being the nomination by the Constitutional Union party, in 1860, of Bell and Everett at Baltimore for the presidency and vice-presidency.

Whip'ple, Abraham, an American naval officer, was born at Providence, R. I. on Sept. 16, 1733. He commanded a privateer in the French and Indian War, and in one cruise took 23 French prizes. During the Revolutionary War his ship took more vessels than any other in the service. After his ship was finally taken by the British, he sailed for France with dispatches in a new ship and encountered the British merchant fleet of 150 vessels on its way to Jamaica. Hiding his guns and running up the British flag, he joined the fleet, and at night captured a vessel, putting on a crew from his own ship, and sent it to America. This he did until he had taken ten ships. He was taken prisoner near Charleston in 1780. His ship was the first American vessel to enter the Thames with the United States flag (1784). He moved west with the Ohio Company, dying at Marietta, O. on May 29, 1819.

Whip-Poor-Will, a bird widely known on account of its oft-repeated cry of *whip-poor-will.* It is not often seen, although it is abundant in damp woods of the eastern United States. It usually rests on the ground during the day and is active at twilight and early nightfall, sending forth its cry and also coursing low over the grass in search of insects. It is about ten inches long and of plain colors, being grayish, much variegated with black and buff. Its bill is very broad, its mouth large and provided with a tuft of long bristles. It builds no nest, but deposits its eggs on leaves or a slight depression in the ground. To the same family belong the chuck-will's-widow and the night-hawk.

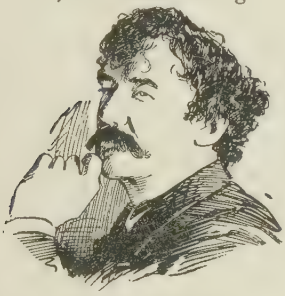
Whirl'pool' is a current in a river, which moves in a circle, owing to opposite tides or winds. The two celebrated sea-whirlpools are Charybdis near Sicily and the maelstrom in the North Sea, which are not usually dangerous to ships; but, when the current and the wind are strongly opposed to each other, large ships are driven against the rocks. Whirlpools were dreaded by sailors and many legends arose about them. They were thought to be openings into great caverns, within whose depths lived mermaids and sea-monsters. Norwegian fishermen still believe that, if they can throw a heavy object into the whirlpool, it will close without injuring their ship. See MAELSTROM and SCYLLA.

Whirl'wind', a small vortex motion of the earth's atmosphere, generally produced by the meeting of two contrary winds. Prof. R. W. Wood has shown a neat method of producing artificial whirlwinds. He heats a large iron plate — say four feet square — by placing a number of Bunsen burners underneath. While the plate is hot, a little sal-ammoniac is scattered over it. The fumes thus produced render visible the vortices formed by the two currents of air coming over opposite edges of the hot plate. See CYCLONE and STORM.

Whis'ky, a spirit or liquor distilled usually from grain of some kind, originating probably among the Celtic inhabitants of Ireland and Scotland, as the name is from the Celtic, meaning water of life. It was first known as *aqua vitæ* (water of life) and used only as a medicine, and was first used as a drink in Scotland in the 17th century. The tax on whisky, imposed partly for revenue but largely to reduce its use, resulted in evasions of the tax by illegal manufacture and smuggling. Whisky was first made from malted barley by distillation (*q. v.*), but can be made from any grain or even from potato-starch or grape-sugar. In the United States it is made largely from corn and rye. A great deal

of whisky is made into alcohol, gin and French brandy. Whisky is nearly colorless when made, but grows red from the wood of the barrels in which it is kept, which are usually charred to help to darken it. It is improved by age. Over 50,000,000 gallons a year are made and consumed in Great Britain, besides beer and wine. In the United States the tax on whisky is one of the greatest sources of revenue to the government. The total production of whisky, distilled spirits and fermented liquors in the United States in 1906 was 180,860,926 gallons. About 45,000,000 gallons of whisky are made annually in this country.

Whistler (*hwĭs'lẽr*), **James Abbott McNeill,** a brilliant Anglo-American painter, etcher and author, was born at Lowell, Mass., on July 10, 1834, and educated at West Point Military Academy. He studied art at Paris and settled at London, England, where he became president of the British Society of Artists and held exhibitions of his pictures. There was a strain of the erratic in his mental composition, which more than once brought him into antagonism with critics of art — notably with Ruskin; but he had genius and gifts of a high order in the impressionist school and attained eminence as an etcher and colorist. Some of his more important paintings include what he termed *A Nocturne in Blue and Gold*, arrangements in black, gray and green; his *Portrait of My Mother* is excellent, as are *The White Girl* and *The Last of Old Westminster*. He also did good work in painting portraits of celebrities, and wrote *The Gentle Art of Making Enemies*. His other published works include *Ten O'Clock*, *Four Masters of Etching* and *The Baronet and the Butterfly*. He died on July 17, 1903.



JAMES WHISTLER

Whit'by, a seaport in Yorkshire, England, on the North Sea, at the mouth of the Esk. The old town has narrow, steep, irregular streets, while the new part has all the features of the fashionable watering-place. The old abbey is in ruins, but Whitby Hall has been restored. The parish church stands on a cliff 350 feet high, with a flight of nearly 200 steps. The piers run out about 1,000 feet in the ocean. The chief exports are jet ornaments and iron, the jet being obtained from a petrified wood peculiar to the region. The herring-fishery is increasing, but the shipping-trade, which was large when the vessels for Captain Cook's voyages were built here, has declined, and the town is gradually becoming merely a watering-place. Population 11,750. Whitby (Whitetown) originally was the seat of a monastery, built by Oswy, king of Northumbria, in 658. The convent connected with it was in charge of Abbess Hilda and became famous. Caedmon (*q. v.*) was a servitor of this abbey. Destroyed by the Danes in 867, it was restored in 1074.

White, Andrew Dickson, American educator and diplomat, was born at Homer, N.Y., on Nov. 7, 1832, and after graduating at Yale traveled and studied in France, and became an attaché to the United States legation at St. Petersburg. In 1857 he was appointed professor of history and English literature at the University of Michigan, and ten years later became president of Cornell University, a post which he held until 1885, contributing $100,000 from his own means, part of which was applied to the equipment of the library of the school of history and political science at Cornell. In 1871 he was appointed one of the United States commissioners to Santo Domingo; in 1878 was commissioner to the Paris Exposition from the state of New York; and from 1879 to 1881 was United States minister to Russia (serving again during 1892–4). In 1897 he was named by President McKinley ambassador of the United States to Berlin, a post he held till 1902. Dr. White is a regent of Smithsonian Institute at Washington, and has been president of the American Historical Society and the American Social Science Association. He is the author of *Lectures on History*, *The New Germany*, *The Warfare of Science*, *History of the Warfare of Science with Theology*, *European Schools of History*, *Studies in History* and *Autobiography*.

ANDREW D. WHITE

White, Edward Douglass, associate-justice of the United States supreme court, was born in the parish of Lafourche, La. on Nov. 3, 1845, and was educated at the Jesuit College of New Orleans and at Georgetown (D.C.) College. He served in the Confederate army during the Civil War, was admitted to the Louisiana bar, and in 1874 was a state senator. From 1878 to 1891 he sat as associate-justice of the supreme court of Louisiana, and from 1891 to 1894 was a member of the United States

senate. In February, 1894, he was appointed associate-justice of the United States supreme court. In politics he is a Democrat.

White, Henry Kirke, an English poet, was born on March 21, 1785, at Nottingham. His mother's ambition led to his being educated as a lawyer instead of following his father's business. His first poems attracted the attention of the owner of the paper, who advised publication of them in book-form. The volume was cruelly treated by the critics, but brought him the friendship of Southey and a scholarship at Cambridge. He is best known by the hymn entitled *The Star of Bethlehem.* He died at college on Oct. 16, 1806. His poems were published by Southey, with a memoir, which attracted public attention and sympathy.

White, Richard Grant, an American author, was born at New York City on May 22, 1821. Though a student of medicine and of law, he adopted a literary career, being for 14 years on *The Courier and Enquirer* of New York, part of the time as editor. The result of his studies and writings on music and art was *Christian Art.* Other works are *National Hymns, Poetry of the Civil War, Words and Their Uses* and *Every-Day English.* Among his best-known articles to the magazines, to which he contributed for 30 years, were those on the plays of Shakespeare. He died at New York on April 8, 1885.

White, Stewart Edward, an American author and story-writer who deals chiefly with western life, was born at Grand Rapids, Mich., on March 12, 1873. He entered the University of Michigan, from which he graduated in 1895, subsequently taking a course at Columbia Law School, New York City. Some years later he developed gifts as a novelist and successively published *The Claim Jumpers, The Westerners, The Blazed Trail, Conjurer's House, The Forest, The Magic Forest, The Silent Places, The Mountains, Blazed Trail Stories, The Pass* and *The Mystery,* the last in conjunction with S. H. Adams. Most of these are realistic studies of the rough life of the western plains, mountain passes and hillsides.

White, William Allen, American journalist and author, was born in Emporia, Kans., in 1868, and educated there and at the University of Kansas. Taking to journalism as a profession, Mr. White has had connection with *The Eldorado Daily Republican, The Kansas City Journal* and *The Star,* and in 1894 he purchased *The Emporia Gazette,* which he still edits and publishes. In the latter, in August of 1896, he wrote a striking article, which was widely commented on, entitled *What's the Matter with Kansas?* Besides a reprint of this article, Mr. White has issued collections of short stories dealing chiefly with American political life. These embrace *The Real Issue, The Court of Boyville, Stratagems and Spoils* and *In Our Town.*

White Ant. See ANT.

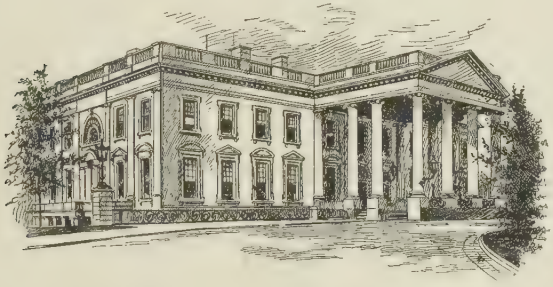
White'bait', a name given in London to the translucent young of the herring and other similar fishes. They are salt-water fishes, but come up the Thames with the tide. Whitebait dinners are stylish and famous. The name is also given to small, colorless fishes, living at considerable depths off the coast of China and Japan but approaching the shores to spawn in their season. They are considered a delicacy by English people living in China.

Whitefield (*hwīt'fēld*), **George,** an English preacher and reformer, was born at Gloucester, Dec. 16, 1714. While at Pembroke College, Oxford, he became associated with Wesley (*q. v.*) and his band of followers, who already were known as Methodists, and even among them was remarkable for his zeal, as shown in his labors in the jails. He preached his first sermon at Gloucester Cathedral, where the earnestness and eloquence of his oratory produced a great impression. Five persons are said to have gone crazy with excitement, but when complaint was made to the bishop he said that he hoped that "the madness would last till next Sunday." The same excitement attended his preaching in London, where the streets were filled in the early morning with persons carrying lanterns on their way to hear him preach, hours before the time of service. The clergy of the English church were offended at Whitefield's open-air preaching, which he soon used almost entirely, owing to their unwillingness to open their churches to him. He and Wesley separated on doctrinal points, and Whitefield's supporters, led by Lady Huntingdon, built him a large shed called The Tabernacle, where immense crowds gathered. He paid seven visits to America, some of them lasting two or three years, where he preached to as large crowds as in England and Scotland, 20,000 persons hearing him at one time on Boston Common. His health failing, he put himself on what he called a short allowance — one sermon a day and three on Sunday. He died on his last visit to America, at Newburyport, Mass., Sept. 30, 1770. Consult *Life* by Tyerman; *Life and Times* by Philip; and Lecky's *History of England,* Vol. II.

White'fish', a common name for a number of fishes of pale or white color belonging to the salmon family. They are inhabitants mostly of lakes in the northern hemisphere. The name applies especially to the common whitefish of the great lakes of North America. This is the largest of the group, reaching a length of about 30 inches. It varies in appearance with age and condi-

tion. It ranges from the region of the great lakes north to the Arctic circle. It feeds on small crustacea, insects and minute organisms in the water. It is one of the finest food-fishes of America. The whiting is a slimmer and smaller variety of whitefish. The smallest and handsomest of the American whitefishes is the lake herring or cisco, a slender fish from ten to 15 inches long. In Europe the name of whitefish is given to any fish with silvery scales and without spots.

White House, the residence of the president of the United States, at Washington, D.C. It is a mile and a half from the capitol, on Pennsylvania Avenue. The corner-stone was laid in 1792, and President John Adams



WHITE HOUSE OR EXECUTIVE MANSION

was the first to occupy it in 1800. In 1814 it was burned by the British and rebuilt and occupied again in 1818. The grounds cover about 75 acres, 20 being inclosed as private grounds. It is built of freestone, painted white, 170 feet long by 86 deep, with a circular porch in the rear and a colonnade in front. The architect was an Irishman, and the house is modeled after the duke of Leinster's palace at Dublin.

White Lady, a being who, according to German legend, appears in snow-white garments with a bunch of keys at her girdle, and sometimes watches over sleeping children. Bertha of Rosenberg, in Bohemia, is one of the most famous of these appearances, and Sir Walter Scott's *White Lady of Avenel* is also celebrated. Consult Baring-Gould's *Curious Myths of the Middle Ages.*

White Lead is one of the compounds of lead, called by chemists basic carbonate of lead, and is used extensively in the manufacture of paint. The Dutch process of manufacture is the oldest. Thin sheets of lead are rolled up and put into earthen vessels, which have some weak vinegar at the bottom. These vessels are surrounded with spent tan-bark or some other material which ferments readily, and thus produces heat and gives off carbon dioxide. The pots are thus left for about six weeks, when the lead is found either thickly coated or entirely changed into the white, basic carbonate of lead. This process is thought to give the best material for fine work, and is used in some of the American white-lead factories, but the patent process manufactures it more cheaply. There are 36 white-lead factories in the United States, the largest being at Brooklyn, and the product is 130,000 short tons a year. The lead used is brought from the Rocky Mountain region.

White Mountains, a chain of mountains in New England, commencing with Mt. Katahdin in Maine and crossing New Hampshire. It has 20 high peaks in New Hampshire, Mt. Washington, the highest, rising 6,293 feet. Mounts Pleasant, Franklin, Monroe, Jefferson, Adams, Madison and Lafayette are other summits. Mt. Washington is the highest point in New England and is a favorite summer-resort, with a hotel on its summit. The first mountain railroad in the world was built up this peak in 1868. White Mountain Notch, Franconia Notch and others are natural openings through which the rivers and railroads pass. At Franconia Notch are the famous profile of stone, 40 feet high, called the Old Man of the Mountains, and Profile Lake, known as the Old Man's Washbowl.

White Plains, N. Y., county-seat of Westchester County, 25 miles northeast of New York City. During the Revolutionary War, in October, 1776, it was held by Washington, while General Howe tried to get around the American army on Manhattan Island. There were several skirmishes, but Washington held the high ground above White Plains until November 5, when Howe moved to Dobbs Ferry and Washington began sending his troops into New Jersey. Population 11,570.

White River, a river of the United States, which rises in the Ozark Mountains, flowing through Missouri and Arkansas into the Mississippi, which it enters near the mouth of the Arkansas. It is 800 miles long, and is navigable for 350 miles.

White Sea, a great bay of the Arctic Ocean on the northern coast of Russia. It pierces the land for 350 miles, beginning with a width of 100 miles and narrowing to 35. It then sweeps south for 200 miles, and, widening, forms the Gulfs of Kandalak, Onega and Archangel. Its coast is about 1,000 miles long, and it covers about 47,000 square miles. Ice forms after August, 30 miles out, and does not melt till next July.

Whit'man, Walt, was born at West Hills, Long Island, N. Y., in 1819. As a young man he was school-teacher, printer, editor and builder. His early verses attracted little or no attention, but *Leaves of Grass* (1855) at once made him one of the most widely read of American poets. In the

pieces which made up this book an irregular rhythm took the place of rime and measure. In this he but followed Matthew Arnold's *Strayed Reveller*, the Old-English poem of *Beowulf* etc. Whitman is variously called by his admirers "the poet of democracy" and "the good gray poet." Professor Beers says: "He liked the people — multitudes of people; the swarm of life beheld from a Broadway omnibus or a Brooklyn ferryboat. The rowdy and the negro truck-driver were closer to his sympathy than the gentleman and the scholar." Whitman himself said: "I sound my barbaric yawp over the roofs of the world." During the Civil War he gave himself up to the care of the wounded soldiers in the Washington hospitals, and about this experience he wrote his *Dresser*. In *Drum-Taps*, poems on the Civil War, is one of his finest pieces, *My Captain*, written after the assassination of Abraham Lincoln. In 1888 appeared his last volume, *November Boughs*. Whitman made his home in the latter part of his life at Camden, N. J., where he died on March 26, 1892. Consult Edmund Clarence Stedman's *Poets of America*.

WALT WHITMAN

Whit'ney, Eli. One fine morning in 1793 a young man with a serious, New England type of face, was sitting in his room in a big plantation-house on Savannah River, Georgia, engaged in studying law. A company of rich planters had arrived from Augusta, and were being entertained by the mistress, the widow of General Nathanael Greene (*q.v.*), a hero of the Revolutionary War. So the young man had withdrawn to his own quiet quarters. Presently he was interrupted by a black servant who said that Mrs. Greene and the gentlemen wished to see him in the drawing-room. He went immediately.

ELI WHITNEY

"Gentlemen," said Mrs. Greene, "this is my ingenious young friend, Mr. Whitney, who has just been graduated from Yale College. Explain what you require, and I am sure he can help you."

"Will you please invent for us a machine for ginning cotton, and do it as soon as possible? The south has unlimited acres for cotton-growing, and the new inventions in England for spinning and weaving have increased the demand enormously. But there is no use in our growing the cotton so long as the fiber must be separated from the seed by hand."

The man to whom interested people would turn in such an emergency could have been nothing less than remarkable. Eli Whitney was 28 years old. He was born on Dec. 8, 1765, a month later than Robert Fulton. But his birthplace was Westboro, Massachusetts, and his ancestry Puritan. His home was a plain, bare farmhouse; his father a stern, unimaginative man who brought his children up to hard work and few pleasures. Every New England farmer at that time had a workshop, and Eli showed such skill in making and mending the many articles needed in house, stable and field, that the shop was practically turned over to him. One cold Sunday, when sickness kept him home from church, he took his father's silver watch apart and put it together again so well that no one knew it had been meddled with. He mended violins and made nails on a little forge during the Revolutionary War, when the supply from abroad failed. Of course he went to school and learned to read and write and cipher. When he was 19, he set about earning enough money to go to Yale College. But it was a long, hard task, and he was 27 when he graduated. He accepted an offer of a position as a teacher in a private school in the south, intending to use his spare time in the study of law.

On the voyage from New York to Savannah he had the brilliant and wealthy Mrs. Greene for a fellow-passenger, who soon discovered that Eli Whitney was no ordinary young man. So, when he discovered that the position was not what it was represented to be, Mrs. Greene insisted that he be her guest until he could place himself to better advantage. His mechanical skill that had supported him through college was now turned to many services for the gracious lady who had befriended him. Thus it came about that law-books were abandoned, and Eli Whitney won fame as the inventor of the machine that brought wealth to the south.

The problem presented was this: There are two varieties of cotton as of peaches — the freestone and the clingstone. Cotton with the loose seed is easily managed by a simple contrivance, like the clothes-wringer, that presses the seed out. This is the sea-island cotton that grows only near water. The tight-seeded cotton-plant that flourishes inland had to have the fibers pulled from the embedded seeds by hand, a slow and expensive process, even when there were slaves to do the work.

Eli Whitney had never examined a cotton-boll when he was asked to invent the gin, but he got the idea at once that only *fingers* of some sort could do the work. Mr. Miller, Mrs. Greene's overseer, agreed to furnish the money for the experiments, and a shop was fitted for Whitney in the basement of the plantation house. The gin consisted of a boxlike enclosure below an open hopper. Inside was a cylinder set with rows of sharp wire-teeth, the whole turning with a crank. A slotted steel-plate half enclosed the cylinder, the teeth slipping through the slots as the crank was turned. As the teeth extended beyond the slots, they caught the fibers and tore them from the seeds, the bolls dropping down from the hopper and the stripped seeds falling through a crevice below. It was a simple device of mechanics, and involved no such principles as lay behind the steam-engine. Its importance was measured by the immediate and tremendous effect the invention had on the south.

The inventor never profited by it financially. His machine was stolen and copied as soon as it was completed; his patent was infringed; his factory burned; his business injured by greed and malice; and lawsuits consumed his earnings and dragged through the courts until the patent's limit of 14 years had expired. His claim to the *honor* of the invention was finally established, and with that he had to content himself. At 40 he was penniless but not defeated. With fame, business ability, rare mechanical genius and a clean name as assets he started an armory, securing not only government orders, but an advance of public money. No firearms were made in the country so good as those of England. By 1807 it was practically certain that the United States would be compelled to fight another war with Great Britain for protection of our mercantile marine. Eli Whitney could be trusted to make good guns and honest guns. So he built his armory near New Haven, Ct., and Whitneyville grew up around it. He had to design all the parts of the improved gun, invent many of the machines used, and train workmen into skilled artizans. His boyhood motto had been: "Whatever is worth doing is worth doing well." This he put into practice. In his factory he instituted the principle of the division and direction of labor that made Arkwright's cotton-mills in England so effective. The great inventor never became so rich as he might have been. Better than money he loved his family and friends, beautiful things and the society of refined and cultivated people. His sister was his dearest friend; his brother a partner in business; he was never too busy to play the devoted lover to his wife or to contrive ingenious toys for his children. His long, fruitless toil to secure his rights in the cotton-gin and the dishonesty, envy and greed that had pursued him for a dozen years left no bitterness behind to poison his life. Prosperity, happiness and renown crowned his later years. He died on Jan. 8, 1825, and was buried in New Haven. Consult Frances M. Perry's *Four American Inventors*. See COTTON, SLAVERY and UNITED STATES (*History*).

Whitney, William Collins, was born at Conway, Mass., July 15, 1841. He studied at Williston Academy, Easthampton, Mass., and graduated at Yale College in 1863. He next studied law, began to practice in New York in 1865, and soon had a large business. His father was a prominent Democrat, and Whitney also became interested in politics in New York City. In 1885 he became secretary of the navy in President Cleveland's cabinet. During his term of office new vessels were added to the navy, and Mr. Whitney is regarded as having been an especially able secretary. He died on February 2, 1904.

Whitney, William Dwight, American philologist, brother of J. D. Whitney the distinguished geologist, was born at Northampton, Mass., Feb. 9, 1827, and died at New Haven, Conn., June 7, 1894. In 1845 he graduated from Williams College, and for several years was employed in a bank at Northampton, meanwhile studying Sanskrit and other languages there, at New Haven and later at Berlin. In 1853 he was appointed professor of Sanskrit at Yale, and in 1870 had added to his chair that of comparative philology in the same institution. Professor Whitney gained a European as well as national fame as a philologist and an expositor of the science of language. His published works, besides a *German Grammar and Reader* and a *Grammar of Sanskrit*, include a work on the *Life and Growth of Language*. He also was editor-in-chief of *The Century Dictionary of the English Language*, completed in 1891. He was president of the American Oriental Society and first president of the American Philological Association.

Whit'tier, John Greenleaf, the Quaker poet, was born in a farmhouse near Haverhill, Mass., Dec. 17, 1807. Here and at the neighboring town of Amesbury most of his life was spent. All the schooling he received was at the district school, with two years at Haverhill Academy. A copy of Burns awoke a desire to write, and he began to send verses to Garrison's *Free Press* and the local newspaper. For a short

JOHN GREENLEAF WHITTIER

time he was editor of *The Manufacturer* at Boston, and for a year and a half edited George D. Prentice's paper, *The New England Weekly Review*, at Hartford. At Hartford he published his first volume of verses — *Legends of New England* (1831). Whittier was back in Haverhill, engaged in farming, when the antislavery movement began, into which he threw himself with the greatest enthusiasm. In 1833 he published a tract against slavery; he helped to found the American Antislavery Society at Philadelphia; and he became the poet of the movement, writing for it his *Voices of Freedom* in 1849 and his *Ichabod*. In 1838–9 he edited *The Pennsylvania Freeman* at Philadelphia, where his office was sacked and burned by a mob. *Laus Deo* was his last poem of freedom, written on hearing the bells ring for the passage of the constitutional amendment abolishing slavery. His chief works are *Maud Muller, Home Ballads, Miriam, National Lyrics, Poems of Nature, Among the Hills, In War Time* and *Ballads of New England*. Among Whittier's larger poems are *Snow-Bound* (*q. v.*), *The Bridal of Pennacook* and *The Tent on the Beach*. He died on Sept. 7, 1892. Consult Stedman's *Poets of America* and H. A. Beers' *American Literature*.

Whit'tington, Sir **Richard,** was born at Pauntley, Gloucestershire, England, about 1356. According to the well-known story, his father died when Richard was ten, and he tramped to London, where he became a merchant's apprentice. At one time he started to run away from his master, but, while seated at the foot of Highgate Hill, seemed to hear in a chime of bells

> Turn again, Whittington,
> Thrice lord mayor of London town.

He did so; married his master's daughter, and became wealthy, his first stroke of business having been to send a cat to an eastern market; was lord mayor of London in 1397; and made loans to Henry IV and Henry V. Whittington died in 1423.

Wichita (*wĭch'ĭ-ta*), **Kas.,** county-seat of Sedgwick County, on Arkansas River, in the midst of a very fertile region. It has 60 miles of street-car lines; factories and packing-houses employing 1,500 workmen; and six railroads. There are good public schools, a high school, a medical college, Lewis Academy, Fairmount College and Wichita University. Its growth has been very fast. In 1870 not an inhabitant was on the site of Wichita; in 1880 the population was 4,911; in 1900 24,671; in 1908 about 33,000.

Wieland (*vē'lănt*), **Christoph Martin,** a German poet and novelist, was born at Oberholzheim, Swabia, Sept. 5, 1733. He was carefully taught by his father, a clergyman. In 1750 he went to the University of Tübingen, where he devoted himself a little to law and very much to literature, and wrote his poem on *The Nature of Things*. After some years in Switzerland, where he supported himself by tutoring and wrote poems and plays, he settled in 1760 at Biberach as director of the Chancery. From 1769 to 1772 he was professor of philosophy at Erfurt, after which he made his home at Weimar. Here he tutored and also edited a monthly magazine, writing an immense number of poems and articles for it. His *Oberon* is held to be the best of his works. Wieland's romances were highly popular, and have not yet been surpassed in Germany. To him also belongs the merit of having first suggested to his countrymen that it might be worth while to study their own literature as well as that of France, England and Italy. He died at Weimar, Jan. 20, 1813.

Wiesbaden (*vēs-bä'den*), a fashionable watering-place of Prussia, stands on the slopes of Mount Taunus, five miles north of Mainz and three miles from the Rhine. Its prosperity is due entirely to its hot springs, and it is filled with hotels, lodging-houses, villas, bath-houses and promenades for the benefit of its 60,000 yearly visitors. The main buildings are the palace, the *Kursal*, the five-towered Protestant church, the Roman Catholic church, the museum with a picture-gallery and a library of 75,000 volumes and the synagogue built in Moorish style. The chief spring is the *Kochbrunnen*, the waters of which are drunk, besides which there are 28 other springs used for bathing. These springs were known to the Romans, who fortified the place. Population 100,953.

Wigan (*wĭg'an*), a city of Lancashire, England, on Douglas River, 18 miles northwest of Manchester and northeast of Liverpool. It is joined by rail and canal with these cities and with London. The main buildings are All-Saints' Church, Albert Edward Infirmary and Dispensary, the arcade, public library and public baths. A park covering 27 acres was opened in 1878. The growth of the city is due largely to its coal-mines, which employ a large part of the people and furnish cheap fuel for its cotton and iron mills. Wigan was a Roman station and later a Danish town. Three battles were fought there during the Civil War of Charles I and the Commonwealth. Population, as extended, 82,434.

Wig'gin, Kate Douglas. See RIGGS, MRS.

Wight, Isle of, a small island in the English Channel, off the coast of Hampshire, separated from the mainland by the narrow strait of the Solent and by Spithead. It is 23 miles long and 13 broad, and covers about 145 square miles. High chalk-downs cross the center of the island from east to west. Along the south coast is the Undercliff, a district noted for its wild scenery and mild climate, where a large hospital

has been built. The isle has long been a favorite place for tourists, and there are fashionable watering places at Cowes, Ryde and other places. Farming, sheepraising, shipbuilding and cement-making are carried on. Vespasian conquered the Celts of the Isle of Wight in A. D. 43. From the time of Henry VII it was ruled by a royal captain or governor. Charles I was imprisoned in Carisbrooke Castle, a fine old ruin, the inner walls of which were built in the 11th century. Near Brading are the remains of a Roman villa. Population 86,000.

Wil'berforce, William, an English philanthropist, was born at Hull, Aug. 24, 1759. He attended Cambridge University, and in 1780 was elected to the house of commons, where he became a friend of Pitt. In 1787 he first began to stir up opinion against the slave-trade, in which he was seconded by Pitt and Thomas Clarkson. Clarkson carried on the work in the country, while Wilberforce endeavored to gain the house of commons. By 1789 he succeeded in getting the subject before the house, but the friends of the planters were too strong, and the matter was postponed. In 1791 he brought it to a vote, but the motion for abolition was lost. He never ceased his efforts, but it was not till 1807, a year after Pitt's death, that the first great step toward doing away with slavery (*q. v.*) was taken, and it was not till a month after his own death that the emancipation bill, which owed so much to his efforts, was passed. Wilberforce also had a leading part in religious measures in Parliament and in religious work out of it. He died on July 29, 1833, and was buried in Westminster Abbey, where a monument has been set up to his memory. Consult *Life* by his sons.

Wil'cox, Ella (Wheeler), was born in 1855 in Johnstown Center, Wisconsin. As early as 14 she wrote poetry that was accepted by the press, and before she was 20 she had secured more than local celebrity. She attended the University of Wisconsin in 1884, but did not graduate. Her early years were a struggle against poverty. She married Robert M. Wilcox, and thus became a resident of Short Beach, Connecticut, where she still lives. She is most widely known through her articles written for *The New York Journal (American)* and for *The Chicago American.* But in the following collections of poems there may be elements that will secure her more permanent fame: *Every-Day Thoughts, Poems of Passion, Poems of Pleasure, Poems of Power, Kingdom of Love* and *Three Women.* Her prose includes *A Double Life* and *Was it Suicide?* In these her work, as she has said, consists in "putting philosophy, religion, morality, psychology and science on a common-sense plane for everyday use." Perhaps this purpose is best realized in *A Woman of the World.* This is a series of letters, written to people young and old, at important moments in their careers. Her poetry, when it deals with everyday subjects, sometimes has much melody, aptness and sweetness; but the attempts to reach the realms of intense passion or of higher speculation are marked, as a rule, by a loss of these qualities and by failure to say anything of much significance. Her prose contains practical wisdom, and should serve to break down some of the intellectual barriers that her readers face. Her philosophy is one of optimism and even of exhilaration. For her estimate of herself see *The Cosmopolitan* for December, 1906.

Wilhelmina (*vĭl'hĕl-mē'nà*), **Helena Pauline Maria,** queen of the Netherlands, was born at The Hague, Holland, Aug. 31, 1880, and is the only child of the late King William III and Princess Emma, his second wife, daughter of Prince George Victor of Waldeck. She succeeded to the throne on the death of her father, Nov. 23, 1890, though she only came of legal age eight years later (1898) when she was crowned queen. On Feb. 7, 1901, she married Prince Henry, youngest son of the late grandduke of Mecklenburg-Schwerin. Queen Wilhelmina is the fourth in the list of sovereigns of the Netherlands of the house of Orange since the reconstruction of the kingdom by the congress of Vienna (1814–5). Her Majesty possesses simple tastes, and is an accomplished linguist and experienced horsewoman.

Wilkes, Charles, an American naval officer, was born at New York in 1801. At 15 he entered the navy. In 1826 he was made lieutenant, and four years later was attached to the naval bureau of charts and instruments at Washington. Here he made the first astronomical observations in America. In 1838 he was given command of a squadron of six ships, with which he surveyed the Samoan Islands, discovered other Pacific Islands and the Antarctic continent, and explored the Fiji Islands. On coming back to Washington he published his *Narrative of the United States Exploring Expedition,* and was made a commander. In 1861, as captain of the United States steamer *San Jacinto,* he seized the Confederate commissioners to England — Mason and Slidell — on board the British steamer *Trent,* and carried them to Boston. This was the *Trent* affair between the United States and England, and resulted in the commissioners being set free. In 1862 Captain Wilkes was made commodore. He died at Washington, D. C., Feb. 8, 1877.

Wilkes'barre, Pa., county-seat of Luzerne County, on the north branch of Susquehanna River, in Wyoming Valley, 98 miles northwest of Philadelphia. The city is built partly on the bottom-lands and partly

on the surrounding hills. It is entered by four railroads. Wilkesbarre is in the midst of a great coalmining district, and is a center for mining-supplies and for coal-shipment, besides having important manufactures of locomotives, leather-goods, lace, cutlery, wire-rope and steel as well as foundries, breweries and silk-mills. Notable public buildings are the city-hall, court-house, post-office, jail, armory and Memorial Hall. It has excellent public and parochial schools, and is the seat of Harry Hillman Academy (for boys), Wilkesbarre Institute (for girls), Wilkesbarre Business College and St. Mary's and St. Anne's Academies. Besides these educational institutions there are two large public libraries, while the Y. M. C. A. and the Law and Library Association and other organizations have library collections. Wilkesbarre was settled in 1770, but eight years afterward the whole region was laid waste by the Wyoming (*q.v.*) massacre, the town being sacked and burnt. The same year a fort was built and the town rebuilt. Its growth is mainly since 1855. Population 60,121.

Wil'kie, Sir **David,** a Scottish painter, was born at Cults, Fifeshire, Nov. 18, 1785. His father, who was a clergyman, placed him in 1799 in Edinburgh Academy, where he gained a prize for his *Callisto in the Bath of Diana.* He settled at London in 1805. In 1836 he was knighted. In 1840 he painted the portrait of the sultan and made a trip to Palestine. As he was returning to England, he died at sea, June 1, 1841. Among his best pictures are *Blindman's Buff, Guess My Name* and *Reading the Will.* Consult his *Life* by Allan Cunningham.

Wil'kinsburg, Pa., a borough of Allegheny County, joining Pittsburgh on its eastern side, seven miles from Union Depot, is entirely a residence town, planing-mills and an ice-plant being the only industries. The majority of the people are employed in Pittsburgh. It has 13 churches, five fine school-buildings, two homes for the aged, a large hospital (managed by the United Presbyterian Church), is served by one railroad, and operates five car-lines to Pittsburgh. Population 6,000.

Wil'kinson, James, an American soldier, though of English parentage, was born in or near Benedict, Md., in 1757. He was privately educated, and in 1773–5 studied medicine in Philadelphia. Relinquishing the latter as a pursuit, he entered the American army at Boston, and with the rank of captain he took part in the invasion of Canada, joining Arnold at Lachine, on the St. Lawrence, with his command. As colonel, he acted for a time on General Gates' staff, and was appointed deputy adjutant-general of the Army of the Northern Department. Though implicated in the Conway scandal (see GATES, HORATIO), Wilkinson served with distinction in the Saratoga campaign and was the bearer to Congress of the news of the surrender of Burgoyne at Saratoga. Though he held various high positions after this and was made a brigadier-general (brevet rank), he became disaffected, and, irate at the criticisms passed upon him, he resigned. At the close of the war he emigrated to Kentucky and engaged in trade at Lexington and in the Mississippi Valley. Here he so far forgot his old allegiance as to propose to Spain to transfer Kentucky and the country beyond the Alleghanies to that power. Recovering his reason, he then sought to reinstate himself in the good graces of his own nation, enlisted in the army under Gen. Anthony Wayne, and indeed succeeded that officer in the latter's command after doing good service against the Indians of the Northwest. In 1805 he became governor of Louisiana; but his duplicity, in connection now with the Aaron Burr conspiracy, once more got him into trouble. Though arraigned and court-martialed for this, he was acquitted, and subsequently served in the War of 1812 in the chief command of the Northern Department. In this position he again fell from grace and was accused of inefficiency and drunkenness, but after trial was once more acquitted and honorably discharged from the army. His subsequent career was spent in Mexico, where he died on Dec. 28, 1825.

Willamette (*wĭl-lā'mĕt*) **River,** the main branch of the Columbia west of the Cascade Mountains, is formed near Eugene City by the junction of three streams which rise in the Cascade Range. It flows north 155 miles, and falls into the Columbia 110 miles from its mouth. It is navigable for 126 miles above Portland for steamboats. Locks have been built around the falls at Oregon City at a cost of $450,000. The chief city on its banks is Portland, and the Willamette Valley is the most thickly settled of any part of Oregon.

Wil'lard, Emma (Hart), American educator and author, was born at Berlin, Conn., on Feb. 23, 1787, and educated privately. At an early age she began to teach, taking positions in Hartford and Westfield, Conn., and later at Middlebury, Vt., where she became principal of an academy for girls, with a boarding-house attached. At Middlebury in 1809 she married John Willard, who died in 1825. Pursuing her professional life-work as a teacher, she connected herself with a seminary for girls at Waterford, N. Y., for which she was instrumental in obtaining partial support from the state. This was in 1821 removed to Troy, a building being offered to Mrs. Willard by the city, and the school, under her excellent and devoted management, became favorably known as Troy Female Seminary. The principalship of this institution she later

transferred to John Hart Willard, her son, and in 1838 she removed and settled in Hartford, Conn., there marrying Christopher C. Yates, with whom, however, she did not live happily. Subsequently she parted from him and reassumed the name of her first husband. In 1830 she made a tour in Europe, of which an account was published as *Journals and Letters from France and Great Britain.* From the profits of this publication she helped for a time to support a school for women in Athens, Greece, which she had founded. Besides her numerous published writings, which include a *History of the United States*, a *Universal History in Perspective*, *Last Leaves of American History* and *Morals for the Young*, she edited a geography and atlas, and wrote and issued a volume of poems, the best known perhaps of which is the song *Rocked in the Cradle of the Deep.* Mrs .Willard died at Troy, N. Y., on April 15, 1870.

Willard, Frances Elizabeth. This gentle Christian reformer and practical philanthropist is the best loved and most widely celebrated of all American women. To her devotion and trained ability is due the phenomenal growth of the Woman's Christian Temperance Union and very largely of the prohibition movement. Born at Churchville, near Rochester, N. Y., on Sept. 28, 1839, she was fortunate in having parents of rare moral and entellectual character. To give their older children educational advantages, they removed to the college-town of Oberlin, Ohio. When Frances was seven they settled on a farm near Janesville, Wisconsin. A beautiful tract it was, half prairie, half forest. For ten years the family depended upon itself for society, and the mother stored her children's minds with elevating verse and Bible stories. At 17 Frances was sent to Milwaukee to school and afterwards to the Woman's College at Evanston, near Chicago. For the next 40 years this was her home. She became dean of her own *alma mater*, resigning in 1874 when the college was incorporated with Northwestern University.

FRANCES E. WILLARD

Turning from the most attractive offers to go on with teaching or to enter journalism, she decided to go into the temperance movement, joining a little band of women without money or experience in Chicago. The matter was talked about, for she was a noted woman of proved leadership in the educational world. To the W. C. T. U. she gave immediate impetus by the conversion of hundreds of men from drunkards to useful citizens. She consented to accept a salary sufficient to provide for her mother and herself and, finally, the modest gift of Rest Cottage, the home in Evanston, but her earnings as lecturer and writer she turned into the W. C. T. U. fund. Five years after beginning the work, Miss Willard was elected president of the national W. C. T. U., —an office she filled for 20 years. She insisted upon the adoption of a demand for woman suffrage by the organization on the ground that the ballot was the most effectual weapon to defend the home. To her, also, is due the fact that the W. C. T. U. practically is a unit politically. She made it clear that little help was to be expected from the old parties. The Prohibitionists held their first national convention in 1884.

After 1880 Miss Willard was almost continually engaged in travel and in organizing states and foreign countries. The movement spread until at the time of her death in 1898, 35 nations had lined up under the white ribbon. In addition to this work she wrote eight books, established and helped edit *The Union Signal*, inspired the Chicago organization to build the Woman's Temple at a cost of $1,000,000, to establish the W. C. T. U Home for workingwomen, a publication-office and national headquarters. All of this grew in 25 years from a beginning so small that Miss Willard could not always get money for carfare and lunches, while the national W. C. T. U. had a total income of only $1,200. In her annual addresses are to be found the history and the policy of the temperance movement of her time.

A scholarly, refined, reserved woman, Miss Willard was aggressive only in act, never in manner. She died on Feb. 18, 1898, leaving little property and worn out by her great uplifting work. A statue of her has been placed in Statuary Hall, in the Capitol at Washington, among those of presidents, statesmen and military heroes. Consult her *Life* by Anna Gordon, her private secretary.

Will'iam I, the Conqueror, son of Duke Robert of Normandy, was born in 1027 or 1028, and became duke in 1035. His guardians had to fight to make good his claim to the dukedom, and more than once his life was in danger. On visiting England, where Edward the Confessor then reigned, William found Norman influence strong at Edward's court, and felt sure that the crown would pass to him. But the *Witenagemote* chose Harold as king, ignoring William's claims. The Conqueror at once invaded England, and won the battle of Hastings and the throne, Oct. 14, 1066. He at first ruled the conquered English

mildly, but an uprising in 1070 was savagely put down, and the hatred between English and Norman thereby aroused forced him to rule harshly. The English were deprived of office, and ground down by taxes, while fortresses garrisoned by Normans were built throughout the country. In 1072 Scotland was invaded and King Malcolm Canmore forced to acknowledge William's authority. A civil war with Robert, his son, was ended through the intercession of Queen Matilda. Most of the latter part of William's life was spent in Normandy, the government of England being intrusted to Bishop Odo, his half-brother. William was rather fat, and a sarcastic remark about his fatness by Philip I of France caused William to raise an army and invade France. He captured and set fire to Mantes, but while watching the blaze he was thrown from his horse, and died on Sept. 9, 1087. Not only was William a successful soldier, but he knew how to rule, and England had never before been so well-governed. Consult Freeman's *History of the Norman Conquest.* See ENGLAND, FRANCE, NORMANDY and NORTHMEN.

William II of England, surnamed Rufus, the second son of William the Conqueror, was born in Normandy in 1056. The celebrated Archbishop Lanfranc was his teacher, and he was his father's favorite son. He had no sooner been crowned, Sept. 26, 1087, than Robert, his older brother, who had inherited Normandy, tried to stir up an insurrection in England. In return William invaded Normandy in 1091. When a peace had been patched up between them, they joined arms against Henry, the third brother, and drove him from Cotentin, a district covering a third of Normandy, which he had bought from Robert. These scenes of strife were carried on throughout William's reign. He invaded Scotland, waged a second war against Robert, and engaged in putting down disturbances in Wales and the north of England. Robert, on leaving for the crusades, sold Normandy to his brother for $50,000. William Rufus' last campaign was in defense of a part of his newly acquired possession, the district of Maine, which was claimed by a chieftain named Helias de la Flèche. He was shot accidentally by an arrow, supposed to have come from the bow of Sir Walter Tyrrel, while hunting in the New Forest, Aug. 2, 1100. Consult Freeman's *Reign of William Rufus.*

William III of England, the son of William II of Orange and Mary, oldest daughter of Charles I of England, was born at The Hague on Nov. 4, 1650. Oliver Cromwell had the young prince shut out from the stadtholdership of the United Provinces, but on the murder of De Witt, William, then 22 years old, was chosen stadtholder. He found the republic in the midst of a seemingly hopeless struggle with Louis XIV, but his ability as a general and his skill as a diplomat at the end of seven years won an honorable peace by the treaty of Nimeguen in 1678. This achievement made him famous throughout Europe. By an alliance, formed at Augsburg in 1686, William became the head of a league of German princes, including Spain and Sweden, against Louis XIV. William had married Mary, the oldest daughter of James II, and to escape that monarch's tyranny the English now looked to the stadtholder as their only hope. He had but to land, Nov. 5, 1688, to bring the whole country to his support, and William and Mary were crowned joint sovereigns. Ireland, however, did not submit until after a two years' contest, and throughout William's reign plots were hatched against his life by the followers of the Stuarts. The league, now strengthened by the addition of England, vigorously carried on its war with France, but the English people never were heartily in favor of it, and William was forced by home pressure and defeats in the field to make the peace of Ryswick in 1697. His reign in England was one of great progress in real liberty for the English people, and William is acknowledged to have been one of the ablest of English kings. He died on March 8, 1702. Consult Macaulay's *History of England* and Traill's *William III.*

William IV of England, the third son of George III, was born at Windsor, Aug. 21, 1765. When 14, he was sent to sea as a midshipman under Admiral Digby. Next he sailed under Admiral Rodney, and took part in the action off Cape St. Vincent. During the remainder of the war the prince saw plenty of service. In 1789 he was made Duke of Clarence. He joined his brothers, the prince of Wales and the duke of York, in their opposition to the king, and took his seat in the house of lords. In 1827, on the death of the duke of York, William became heir to the throne, and was crowned king on June 28, 1830. The great event of his reign was the passage of the reform bill, June 4, 1832. He died on June 20, 1837. See Greville's *Memoirs* and Fitzgerald's *William IV.*

William I, king of Prussia and German emperor, was the second son of Frederick William III of Prussia. He was born at Berlin, March 22, 1797. Though a delicate child, he became one of the most vigorous men in Germany. Made a captain in 1813, he accompanied his father in the campaign of 1814, and next year was given the iron cross for his bravery at Bar-sur-Aube. When 21, he was made major-general, and mastered the military system of his own and other European countries. On the accession of Frederick William IV, his brother, in 1840, he became heir to the throne and was made Prince of Prussia.

At the outbreak of the revolutionary movement, in 1848, William saw that some of the demands for a freer government must be granted, but urged that order should first be restored. At this time he was the best hated man in Germany. In 1849 he skillfully crushed the rebellion in the grand-duchy of Baden, at which time an attempt was made upon his life. On Jan. 2, 1861, he became king of Prussia as William I. The successful wars against Denmark and Austria changed the feelings of his subjects toward him, and on his return to Berlin he was received with unbounded enthusiasm, being looked upon from this time as the father of his people. On the outbreak of the war with France, in 1870, all Germans rallied round the king of Prussia, and, when he quitted Berlin to join his army, he knew he had the support of a united nation. He personally commanded at the battles of Gravelotte and Sedan, and during the siege of Paris was proclaimed German emperor, Jan. 18, 1871. He left the destinies of Germany almost entirely in the hands of Bismarck, the chancellor of the empire. William died at Berlin, March 9, 1888. Consult A. Forbes' *Life of Emperor William.*

William II, emperor of Germany and king of Prussia, is the oldest son of Emperor Frederick III (*q. v.*) of Germany and Victoria, Princess Royal of Great Britain. He was born on Jan. 27, 1859. After being tutored at home, he entered Cassel Gymnasium, where he graduated in 1877. He then took a course under the professors of Potsdam Military Academy, and was made a colonel of hussars. William II became emperor on June 15, 1888. He at once went back to the policy of William I and Prince Bismarck, much to the disappointment of the great body of the nation, who had looked forward to enjoying the more liberal government which it was felt that Emperor Frederick would have given to Germany had he lived. The chief events of William's reign have been the forced retirement of Prince Bismarck the chancellor, the most powerful of his subjects, owing to their disagreements as to measures to be adopted toward the socialists, who are fast becoming one of the most powerful of the political parties of Germany; the widening of Germany's colonial empire; the interest taken by the empire in the punitive expedition to China after the attack on the European legations at Pekin; and the struggle in the Reichstag over the increase of the army deemed necessary by the emperor in view of the state of Europe.

KAISER WILHELM II

William, Prince of Orange, called William the Silent, founder of the independence of the Netherlands, was born at Dillenburg, Nassau, April 16, 1533. He inherited Nassau from his father and Orange from a cousin. As a boy he was a page at the court of Charles V, who gave him the command of a body of troops and employed him in diplomacy. When Philip II left for Spain, he appointed William one of the state council to help Margaret of Parma to rule the Netherlands as regent. He opposed the persecution of the Protestants, and refused to permit it in the provinces of which he was stadtholder. When the duke of Alva marched to Brussels and put Egmont and Horn to death, William, who had fled to Germany, had his property seized and a son sent to Spain as a hostage. After raising an army he marched against Alva, but was forced to retire to French Flanders, and with his brotners joined the Huguenots under Coligni. In 1569 he sent out privateers, known as the beggars of the sea, who captured Briel in 1572. This exploit was followed by the rebellions of Flushing, Haarlem, Dort, Leyden and other cities, which acknowledged William of Orange as their prince. William captured several other towns, but the massacre of St. Bartholomew destroyed his hopes of French aid, and he was forced to disband his army. The Spaniards retook city after city, sacked Haarlem after seven months' siege, and defeated and slew his brothers. But William by cutting the dikes and flooding the country, enabled Admiral Brissot to bring his fleet to the relief of Leyden, which had long been besieged. In 1576 the five provinces which had all along held to Spain joined the states general at Ghent, and formed a league under William. But two years later Don John of Austria, the new Spanish governor, won a victory near Gembloux. His successor, Alexander Farnese, also gained the Walloon provinces. But William in 1579 formed a league between Holland, Zealand, Utrecht, Friesland, Gelderland, Groningen and Overyssel, which was the foundation of the Dutch Republic. Two years later the United Provinces declared themselves independent, July 26, 1581. William twice refused to become the ruler of the new country, and was assassinated at Delft, July 10, 1584. Maurice of Nassau, who distinguished himself in the Thirty Years' War as a military genius, was a son

of his. William III of England was a grandson of William the Silent. Consult Motley's *Rise of the Dutch Republic* and Harrison's *William the Silent*. See HOLLAND, PHILIP II and SPAIN.

William and Mary College, second in age only to Harvard among American colleges, was chartered in 1693 and is at Williamsburg, Va. It started with an endowment of lands and funds, was the richest college in America in 1775, but lost the bulk of the endowment after 1775 and closed in 1781. The college was reörganized after the Revolution, Virginia granting land to it and Washington serving as chancellor during 1788–9. Until 1819 the college was the surveyor, first of the colony, then for the state, and among the surveyors it appointed were Washington and Jefferson. In 1776 Phi Beta Kappa was founded by Jefferson at William and Mary; in 1779 the elective system was partly introduced, the first in the United States; and William and Mary also was the first college to introduce the honor-system among students. The college has always included history and political science among its studies, being the first in America to found chairs of law and history. Among its graduates were Chief-Justice Marshall, Edmund Randolph, General Winfield Scott and Presidents W. H. Harrison, Jefferson, Monroe and Tyler, the last becoming chancellor. During 1862–8 the college was closed, as also during 1882–7. In 1869 the college reöpened, and again in 1888. The courses of study consist of the collegiate and the normal course. The first is an elective course that groups the elective studies. The second is two years long, but Whaley School adds a year of practical work to the normal course. The state annually appropriates $25,000 to the college. In 1907 the faculty numbered 25, the students 235, the library 15,000 volumes. The college is undenominational.

Williams, Sir **George,** founder of the Y. M. C. A., was born at Dulverton, Somerset, England, on Oct. 11, 1821; and was converted at Bridgewater in 1837. In 1841 he became an assistant in a dry-goods firm in London, where he was struck with the neglected condition of the young men. In 1843 he induced some of the employees to hold prayer-meetings at regular intervals, and in June, 1844, Williams and eleven other persons formed themselves into a society under the name of the Young Men's Christian Association (*q. v.*), "a society for improving the spiritual conditions of young men engaged in the drapery and other trades." This society spread rapidly; in 1851 associations were formed in New York, Boston, Philadelphia and Montreal. From 1863 to 1885 he was treasurer of the organization; he then became president. He also became head of the firm of Hitchcock, Williams and Company, and in 1894 was knighted. He died on Nov. 6, 1905.

Williams, John, a noted English missionary, was born at Tottenham, near London, June 29, 1796. He was trained as an iron-monger, but in 1816 went as a missionary to the South Sea islands. After learning the native language by a short stay at Eimeo in the Society Islands, he made his headquarters at Raiatea. His success as a missionary here and elsewhere was remarkable. The people rapidly became Christians, and adopted many civilized habits. Williams traveled unceasingly among the various islands, planting stations and settling native missionaries, whom he himself had trained. From the Society Islands he visited the Hervey group, where he discovered the island of Raratonga. Most of the people of the group were converted in a remarkably short time, and Williams' influence over them was very great. At their request he drew up a code of laws for their government. At Raratonga he built himself a ship with the help of the natives, and with this he made voyages to Samoa and other islands. In 1834 Williams came back to England, and printed his translation of the New Testament into Raratongan. Four years afterwards he went back to the Pacific, and while visiting Erromango, one of the New Hebrides, was murdered by the natives on Nov. 20, 1839. Consult Ebenezer Prout's *Memoir of John Williams*.

Williams, Roger, born in Wales probably in 1607, was one of the founders of Rhode Island. In early life he left his home and went to London. Here his skill as a reporter gained him the patronage of Sir Edward Coke, who sent him to the famous Charterhouse School and then to one of the universities. He next studied law, but, changing his mind, became a clergyman. On account of his Puritan beliefs he left England and reached Massachusetts Bay in 1631. He preached for some years at Plymouth and at Salem. Chiefly on account of his strongly expressed opinion that the government should have no control of religious matters, he was exiled from the Massachusetts colony at Boston. In January of 1636 he left with a few followers for Narragansett Bay. At first the band settled on the site of Seekonk, Mass. But in June Williams and five others embarked in a canoe for Rhode Island and founded a settlement, to which Williams, in remembrance "of God's providence to him in his distress," gave the name of Providence. He went to England in 1643 and next year obtained a charter for the colony, of which he was made deputy president in 1649. In 1651 he made a second voyage to England in behalf of the settlers and spent three years there, during which he enjoyed the friendship of Milton, Cromwell and

other leading Puritans. From 1654 to 1658 Williams was governor of the colony. He died in March of 1684.

Williams, Samuel Wells, the historian of China, was born at Utica, N. Y., on Sept. 22, 1812. After studying at Rensselaer Institute at Troy, he went to Canton in 1833 as a printer in the employ of the American Board of Foreign Missions. In 1853 he acted as interpreter to Commodore Perry's expedition, which opened Japan to the world. As secretary of legation at Pekin he was of great help in making the treaty of 1856 between China and the United States. In 1876 he became lecturer on Chinese at Yale College. He published several valuable Chinese dictionaries and textbooks, but is best known by *The Middle Kingdom*, which is held both in America and in Europe to be an authority on Chinese history, life and manners. Professor Williams died at New Haven, Conn., Feb. 17, 1884. Consult F. W. Williams *Life* of him.

Williams College, a Congregational college for men, is at Williamstown, Mass. It was founded as a free school in 1785 by the bequest of Ephraim Williams, a soldier of Massachusetts in the French and Indian War, who had been killed 30 years before near the head of Lake George. The school opened in 1791, and incorporated as a college in 1793. In 1806 a student of Williams, named Mills, held a prayer-meeting with some fellow-students that resulted years later in the founding of the American Board, — the first society in the United States for missions to pagan countries. In 1854 the graduates of the college erected a monument to Col. Williams at the spot where he fell, and in 1906 another was put up at Williams College itself to commemorate the students' meeting that has become known as the Haystack Prayer-Meeting. In 1836 Mark Hopkins (*q. v.*) of whom Garfield in effect said that he was a university in himself, became president, and during his administration the little college entered on a career of prosperity that has never ceased. Courses of study are arranged in the groups of language, philosophy and science. During the first year of the four-year courses the studies largely are required studies. Those of the remaining years are elective studies, but in each group the student must choose a set quantity of study in each group and a major course. There are 77 scholarships, one being a special prize. In 1907 the faculty numbered 57, the students 472 and the library 59,600 volumes. The productive funds amounted to $1,455,304, and the income was $170,555.

Will'iamsburg, Va., county-seat of James City County and formerly the capital of Virginia, is about 50 miles southeast of Richmond and as far from the entrance to Chesapeake Bay. It is built on high ground on the tongue of land between James and York Rivers. Here is the eastern insane asylum of the state, opened in 1773, the oldest institution of the kind in America. The Episcopal church was built in 1678. The town, which was named after William III, was ordered built by the Virginian general assembly in 1699, and in 1700 the seat of government was moved here from Jamestown. The capital was changed to Richmond in 1780. Williamsburg is noted as the seat of the College of William and Mary (*q. v.*), walls of which, dating from 1693, still stand. Williamsburg, besides its wealth of history, is quite a progressive center of business. Population 3,000.

Will'iamsport, Pa., county-seat of Lycoming County, on the west branch of the Susquehanna, 95 miles northwest of Harrisburg. The postoffice, city-hall, Williamsport Hospital, Home for the Friendless and the Masonic Temple are among the principal public buildings. The leading educational institutions are Dickinson Seminary, two parochial schools (R. C.), two commercial colleges, 14 public grade-schools and a high school. Of its public schools the city feels justly proud. Williamsport is the center of Pennsylvania's lumber-trade, and in the spring the west branch is filled with pine and hemlock logs. It has large and rapidly growing manufactures, the most prominent being woodworking machinery, furniture, wire-ropes, nails, band-instruments, radiators and power-transmission machinery. The city was settled in 1797. Population 29,246.

Will'iamstown, Mass., 5 miles west of North Adams and 40 east of Troy, N. Y., is on the Fitchburg (Boston and Maine) Railroad. It nestles among the famous Berkshire Hills, and is the seat of Williams College (*q. v.*). Population 5,013.

Willimantic (*wĭl'ĭ-măn'tĭk*), **Conn.,** a city in Windham County, at the junction of Willimantic and Natchaug Rivers, 35 miles from Hartford. Within the limits of the city the Willimantic falls 91 feet, and affords excellent waterpower. The important manufacturing industries are thread and silk mills, cotton-warp mills, a spool-factory, silk-machinery works, print-factories and foundry and machine shops. In the city are parochial and public schools, a high school, a public library containing about 6,000 volumes, Dunkirk Hall Library and a state normal school. Willimantic was incorporated as a borough in 1833, and chartered as a city in 1893. It has the service of the Central Vermont and New York, New Haven and Hartford railways. Population 9,111.

Wil'lis, Nathaniel Parker, was born at Portland, Me., Jan. 20, 1806. He graduated at Yale College in 1827, and in the same year published *Poetical Sketches*. He

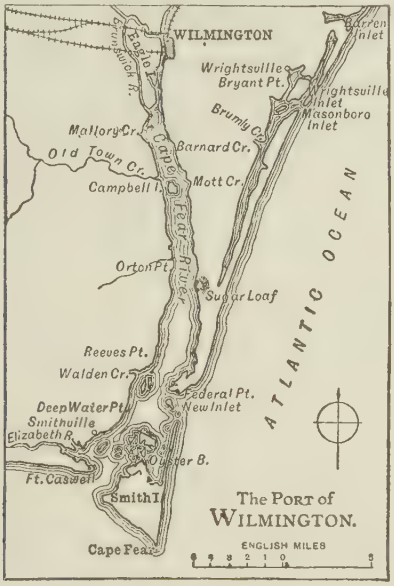
wrote for the magazines, and in 1829 started *The American Monthly Magazine*. After its death in 1831, he traveled in Europe, recording his saunterings in *Pencilings by the Way*, which with its lifelike and rapid sketches of Old-World scenes at once gained wide popularity. These pencilings were contributed to *The Evening Mirror* of New York City, for which Poe also wrote. In 1839 appeared *Letters from Under a Bridge*, the most charming of Willis's books Others of the best of his writings are tales and sketches, as *F. Smith, The Ghost-Ball at Congress Hall* and his simpler poems, like *Unseen Spirits, Spring* etc. Willis died on Jan. 20, 1867. Consult Henry A. Beers' *Life*.

Wil'low, a class of trees of the same family as the poplar. Willows vary in size from those of the Alps, which are an inch or two high, to trees of from 50 to 80 feet. They are found in most countries, with the exception of Australia; rival the birch in wandering far northward; and in the New World are found as far south as Chile. The catkins, usually yellow, appear before or with the leaves, stamen-bearing flowers on one tree, pistil-bearing ones on another. The flowers are rich in honey, and so are prime favorites with bees. Willows scatter their seeds prodigally; and their twigs and branches take root readily and grow rapidly. The trees have many and large roots, which grow a long distance through moist soil and bind it with a network of fibers, thus preventing the banks of streams from being worn away. The bark is tough and bitter, charged with salicylic acid. It is used for making fishnets, ropes, tan-bark and sometimes, in Norway and Sweden, for mixing with oatmeal. The wood is used in houses, vessels, farm-tools and casks; as fuel; and for charcoal. The twigs and young shoots are used in making baskets and light furniture. Willow leaves show a great variety of greens, ranging from a yellow to a blue green; they grow on short stalks one by one along the twigs. There are some 60 North American willows, ten of which are not found elsewhere. The most important of all kinds is the white willow, common throughout Asia, Europe and America. It sometimes reaches the height of 80 feet. It is very useful on the prairies, as it is a fast grower and also protects other trees from the wind. Other kinds are the golden osier or yellow, the blue, brittle, varnished and green willows. Very ancient is the use of willow-withes in the making of ropes and baskets. To-day the willow-ware industry is receiving increasing attention. The wood is light-colored and light in weight. Its charcoal is preferred above others for gunpowder. The weeping willow, a native of Asia and North Africa, has been introduced into America, and the drooping, supple branches are generally familiar. It grows to a large size and a great age. The tree is frequently planted in cemeteries. It is a favorite in China, and has a prominent place in Chinese pictures. A famous weeping-willow marks Napoleon's empty grave at St. Helena. In olden days the wearing of the willow was sign of despairing love. The pussy-willow is common in the United States. Usually it is but a shrub. It bears well-known, silky, white catkins, which, appearing so early in spring, are eagerly hailed as vernal heralds. Gall-insects work much harm on the willows, and gall-growths are often found on twig and leaf.

Wil'mington, Del., the county-seat of Newcastle County and the largest city in the state, is on Delaware River, 28 miles southwest of Philadelphia. The city stands on hilly ground between Brandywine and Christiana Creeks, and slopes toward the Delaware, which is not yet reached by the built-up part of the city. At this point, 65 miles from the ocean, the Delaware is three miles wide, with 30 feet of water at mid-tide in its shallowest parts. There are electric lights and electric street-cars. A fine park has been laid out along the Brandywine. The principal buildings are the government's building, county court-house, city-hall, St. Peters' Orphanage (R. C.) for girls, St. Joseph's Home (R. C.) for colored people, two homes for the aged, two hospitals and several other charitable institutions. The city annually expends $258,005 on its public schools, which have 253 teachers and 11,005 pupils. The high school has a handsome building and furnishes manual training. Other educational institutions are Hebb's School, Wilmington Friends' School, Wilmington Military Academy, Ursuline Academy, Goldey College and Wilmington Business College. The city has three libraries and 60 churches. The Swedes' church, founded in 1698, received funds from William Penn, a Bible from Queen Anne and a communion service from the miners of Sweden. Among the larger manufactures are railroad passenger-cars, for which it is the second city in America, powder, flour, morocco, carriages and iron shipbuilding. Wilmington was founded in 1732 on the site of the first Swedish settlement in 1638. Population 85,140.

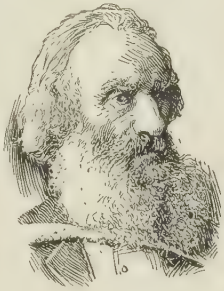
Wilmington, N. C., capital of New Hanover County, the largest city and chief port of North Carolina, is on Cape Fear River, 20 miles from the sea and 110 southeast of Raleigh. It is a railroad center, and its wharves are kept busy with a large coastal and foreign trade. Steamers run to Baltimore, Philadelphia and New York. The chief exports are lumber, turpentine, rosin, tar, pitch, shingles and cotton. The manufacturing industries consist of these articles and of the manufacture of men's clothing, wagons, carriages and cotton,

foundry and machine products. Among the prominent public buildings are the county court-house, city-hall, Masonic Temple, three hospitals, the United States Marine Hospital, two charitable institutions and 33 churches. There are public and parochial schools, and the city also contains Cape Fear Academy, Alderman's School, the Academy of the Incarnation (R. C.) and Gregory Normal School (colored). Wilmington was first called Newton, and was founded in 1733. During the Civil War it was a noted port for blockade runners until the capture of Fort Fisher at the mouth of Cape Fear Inlet by General Terry in January of 1865. In February of the same year General Schofield forced the Confederates to abandon Wilmington. Population 25,000.



Wil'son, Alexander, an American naturalist, was born at Paisley, Scotland, July 6, 1766. He was a weaver and peddler, and at 24 published a volume of poetry. In 1794 he reached Newcastle, Del., with but a few borrowed shillings in his pocket. While peddling through New Jersey he began to study the habits of birds, and after teaching some years he determined to form a collection of American birds. His first trip was made in 1804 through the unbroken wilderness of western New York to Niagara Falls. He gave an account of this journey in his poem of *The Foresters*. His position of assistant-editor of *Rees' Cyclopædia* gave him more means and time for his undertaking, and, when the first volume came out in 1808, he spent some months in tramping, "looking for birds and subscribers." He sailed down the Ohio to Louisville, and rode on horseback from Nashville to New Orleans. He made another tour of the eastern states in 1812. He had, however, overworked himself in preparing his book, and lived only to finish seven volumes. Two more were edited by George Ord, who had accompanied him on some of his journeys, and the work was carried further by Charles Lucien Bonaparte. Wilson was the first to make a careful study of American birds, and his great work on *American Ornithology* is a scientific classic. The author died at Philadelphia, Aug. 23, 1813. Consult *Difficulties Overcome* by C. Lucy Brightwell.

Wilson, Sir **Daniel,** a Scoto-Canadian educator and archæologist and from 1881 to 1892 president of Toronto University, was born at Edinburgh in 1816. Famous "Kit North" was his brother. In 1853 he was appointed professor of history and English literature in University College, Toronto, succeeding to the presidency in 1881. His writings embrace *Prehistoric Man; Prehistoric Annals of Scotland; Memorials of Edinburgh; Caliban the Missing Link;* and a study of *Chatterton*. He was knighted in 1888, and died at Toronto, Aug. 7, 1892.


DANIEL WILSON

Wilson, Henry, eighteenth vice-president of the United States, was born at Farmington, N. H., Feb. 16, 1812. His proper name was Jeremiah J. Colbaith, which at 21 he changed for some unknown reason to that of Henry Wilson. His father was a day-laborer, and poor. When ten years old, the boy went to work as a farm-hand. He was greedy for reading, and before the end of his apprenticeship had read more than a thousand volumes. He then walked to Natick, Mass., and learned the trade of shoemaker, by which he paid his way through Concord Academy. After setting up as a shoe-manufacturer he became a noted public speaker in support of Harrison in the campaign of 1840. For the next ten years he was regularly elected to the legislature of Massachusetts. In 1848 he left the Whig party and became a Free-Soiler. In 1853 he was defeated for governor on the Free-Soil ticket, but two years later was made Sumner's colleague in the United States senate. Wilson had helped to form the anti-slavery society; throughout his political life he had earnestly upheld antislavery; and he became one of the founders of the Republican party. In 1872 he was chosen vice-president on the ticket with Grant, but died on Nov. 22, 1875. He left three important historical works: *Antislavery*

Measures in Congress, Reconstruction Measures in Congress and *The Rise and Fall of the Slave-Power in America.* Consult Nason's *Life.*

Wilson, James Harrison, American soldier (major-general United States volunteers), was born near Shawneetown, Ill., Sept. 2, 1837, and was educated at McKendree College there and at West Point, where he graduated in 1860. He was assigned to the corps of topographical engineers, serving in the department of Oregon. He was distinguished as an officer of engineers in the Civil War, notably in the Richmond raid and in the operations near Petersburg; in 1864 he commanded the 3d division of Sherman's cavalry and the cavalry corps in the military division of the Mississippi; participated in the capture of Fort Pulaski, took part in the campaigns of Antietam, Vicksburg, Chattanooga and the Wilderness; commanded in the assault and capture of Selma and Montgomery, Ala., Columbus and Macon, Ga., and finally in the capture of Jeff Davis. After the war he was engaged in railroad and engineering operations; and in the war with Spain he commanded the 1st division of the 1st army corps in the campaign in Porto Rico. He is the author of *China; Andrew J. Alexander;* and (with the late Chas. A. Dana) a *Life of General Grant.*

Wilson, James H., U. S. Secretary of Agriculture since March 5th, 1897, was born in Ayrshire, Scotland, Aug. 16th, 1835. He came to the United States in 1852, and settled in Norwich, Conn., with his parents. In 1855 he moved to Tama County, Iowa, where in 1861 he engaged in farming. He was a member of the 12th, 13th and 14th assemblies of Iowa, of the last of which he was speaker. He was the state's railway commissioner and a member of Congress during 1873-7 and 1883-5. From 1870 until 1874 he was regent of the University of Iowa. From 1890 until 1897 he was director of the Iowa Agricultural Experiment-Station, and for a time he was professor of agriculture at Iowa Agricultural College. He was awarded the degree of LL. D. by the University of Wisconsin in 1904. In 1894 he was appointed Secretary of Agriculture by President McKinley, and was retained by President Roosevelt.

Wilson, John, famous as the "Christopher North" of *Blackwood's Magazine,* was born May 18, 1785, at Paisley, Scotland, where his father was a rich manufacturer. Sir Daniel Wilson (*q. v.*) of Canada was his brother. After being privately tutored, he spent four years at Glasgow University and then four more at Oxford, where he led both in scholarship and in athletics. On leaving Oxford he settled in the beautiful lake-country of Cumberland, where he soon became a close friend of Wordsworth, Southey, Coleridge and De Quincey, and amused himself by measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom said that he was "a vera bad un to lick." After writing his first two poems, *Isle of Palms* and *The City of the Plague,* most of his fortune was lost through the rascality of a relation, and Wilson went to Edinburgh and became a lawyer. In 1817 *Blackwood's Magazine* was founded, for which, during its earlier years, Wilson and Lockhart, his friend, were the writers who gave it its success. In 1820 Wilson was made professor of moral philosophy in Edinburgh University. Here he had almost unexampled power of rousing the enthusiasm of his students. He, however, cared little for dignity, and on more than one occasion the professor of moral philosophy took off his coat in the public market-place to punish some ruffian. The amount of his writings in *Blackwood's* was enormous; from this mass he selected and published *The Recreations of Christopher North* (1842). The power of his genius is best seen, perhaps, in the series of table-talks called *Noctes Ambrosianæ.* As a writer and a man the Scotch idolized him almost as much as they did Burns and Scott. He died at Edinburgh, April 3, 1854. Consult the *Memoir* by Mrs. Gordon, his daughter.

Wilson, William Lyne, LL.D., American statesman and late president of Washington and Lee University, was born in Jefferson County, Va., May 3, 1843, and died at Lexington, Va., Oct. 17, 1900. After an education at Columbian College (D. C.), and at the University of Virginia, he served for a time in the Confederate army, subsequently becoming a professor of Latin in Columbian College and president of West Virginia University. He also studied and practiced law, and from 1883 to 1895 was a member of Congress, regent of Smithsonian Institution and president of the national Democratic convention of 1892. Between 1895 and 1897 he was postmaster-general of the United States, and in the latter year he accepted the presidency of Washington and Lee University. While in Congress, he drafted the bill for the revision and reduction of tariff-duties, known as the Wilson tariff-bill. See TARIFF.

Wilson, Woodrow, American historian and president of Princeton University since 1902, was born at Staunton, Va., Dec. 28, 1856, and graduated at Princeton in 1879. He subsequently studied and practiced law, and for a time was professor of history and political economy at Bryn Mawr College. In 1888-90 he was professor of history and political economy at Westleyan University. In 1890 he was appointed professor of politics and jurisprudence at Princeton. His writings embrace *George*

Washington: Congressional Government: a Study in American Politics; The State: Elements of Politics; Division and Reunion; and *History of the American People.*

Win'chell, Alexander, a distinguished American geologist and author, was born at North East, Dutchess County, N. Y., Dec. 31, 1824, and died at Ann Arbor, Mich., Feb. 19, 1891. In 1847 he graduated from Wesleyan University, Middletown, Conn., taught natural science afterwards, and for a time was president of Masonic Female University, Selma, Ala. In 1854 he became professor of physics and civil engineering in the University of Michigan, and in the following year was transferred to the chair of geology, zoölogy and botany there, which he held until 1873. Between 1873 and 1878 he held the same position at the University of Kentucky and a lectureship in geology at Vanderbilt University. In 1897 he was recalled to the University of Michigan as professor of geology and paleontology, a post which he retained for the remainder of his life. His published writings embrace *Sketches of Creation, The Doctrine of Evolution, The Geology of the Stars, Reconciliation of Science and Religion, Pre-Adamites, Sparks from a Geologist's Hammer, World-Life: a Comparative Geology, Geological Excursions* and *Geological Studies.*

Win'chester, Ky., county-seat of Clark County, on the Chesapeake and Ohio, Louisville and Nashville and Lexington and Eastern railroads, 18 miles east of Lexington. It is the seat, dating from 1866, of Kentucky Wesleyan College (Methodist Episcopal South), while the city dates from 1792 and is in a good farming country. Its chief industries include the manufacture of furniture, carriages, spokes and rims, overalls, gasoline engines, confectionery and planing-mill products. Population 5,964.

Winchester, Mass., a town in Middlesex County, on the Boston and Maine Railroad, eight miles northwest of Boston, of which it in large degree is a suburban residence with a fine system of parks. Settled early in the 17th century, it has been known successively as Waterfield, Charleston Village, Woburn and, finally, as Winchester. Besides a state aviary and a Home for the Aged, it has a well-equipped public library. Its industries embrace machinery of various kinds, felt and leather goods, watch-hands etc. Population 7,248.

Winchester, Va., county-seat of Frederick County, on the Baltimore and Ohio and Cumberland Valley railroads, about 75 miles west-northwest of Washington. Historically it is noted for its importance in the Revolutionary and the Civil War. It possesses a number of educational institutions, including Valley Female College of the Methodist Episcopal Church South; and it has National and Confederate cemeteries in the neighborhood. Besides its farming, lumbering and stock-raising, it is noted for its glove, leather, woolen, flour and paper works, besides bark-mills and an ice-plant. Population 5,161.

Wind'mill', a wheel driven by the wind for the purpose of obtaining power. Windmills have been used since the 12th century in Europe. The European mill, sometimes called the Dutch mill from its extensive use in Holland for pumping purposes, usually consists of four inclined, radial arms, revolving on an axis nearly horizontal. These arms are covered with canvas, and the diameter of the wheel generally is very large. One is mentioned with a diameter of 150 feet, but a common diameter is about a third of this. These wheels are largely used for pumping water and for grinding grain. They have various schemes for setting them to face the wind, a common method in Germany being to rotate the whole tower on wheels. The windmill has been developed in the United States along different lines, and the American windmills are so superior to the older forms that now they practically control the market. The American windmill consists of a wheel with a great number of narrow, radial, inclined arms of wood or metal, the axis of the wheel being horizontal and the direction of the wheel being regulated by an arm carrying a vane. These wheels vary in diameter from ten to 30 feet; the largest sizes in ordinary winds develop as high as four H. P. The ordinary pumping-wheel develops less than one-quarter H. P. The number of hours that they run depends on local conditions. Wolff, who has written the best book on windmills, estimates an average of eight running hours a day for most parts of the United States. The number of windmills in use is very great, and the manufacture of them is a very large industry. One firm in the United States is said to make nearly 20,000 windmills annually. For small powers where constant and continuous service is not vital, as in pumping water, grinding feed etc., windmills are, according to Wolff, the cheapest power available.

Win'dom, William, an American politician and financier, was born at Waterford, Ohio, on May 10, 1827. After being admitted to the bar, he went to Minnesota and entered politics as a Congressman in 1858. He was regularly reëlected for ten years, and was in his second term as United States senator when, in 1881, he was appointed secretary of the treasury in President Garfield's cabinet. On Garfield's death he resigned and was at once sent back to the senate, having in the short time that he held his secretaryship gained the repu-

tation of being a worthy successor of Hamilton, Gallatin and Sherman. In 1889 he was again made secretary of the treasury in President Harrison's cabinet, but died at New York, Jan. 29, 1891.

Win'dow, an opening in the wall of a building to admit light and ventilation. Windows were practically unknown among the Greeks and Romans; at least, the few windows used were mere holes in the sides of the building. Even among the Anglo-Saxons a window carried with it no association of glass as it does to us, for the early windows in England were merely covered with stretched hide or filled with lattice-work. The Anglo-Saxon word for window is *eagdura*, that is, an eye-door; and our word for window is a compound of *wind* and *eye*. Even as late as the discovery of America, 1492, windows were enormously expensive. Consult Traill's *Social England*, Vol. II., p. 572. It is only since the days of cheap glass that the luxury of windows, as we now understand them, has been enjoyed by every one.

Winds are currents in the earth's atmosphere, produced by disturbances which result from differences of temperature in different parts of the country. Thus the air in contact with heated ground becomes heated itself and rises to the upper regions, thus diminishing the barometric pressure in that locality. Accordingly the air flows in from neighboring regions where the barometric pressure has not been diminished, and this current is what is known as a wind. Winds have received various names, according to their velocities and their characteristics. Thus a barely perceptible wind moves from one to two feet a second; a moderate breeze from 10 to 20 feet a second; a fresh breeze from 20 to 30 feet a second; a strong breeze from 30 to 55 feet a second; a storm from 55 to 90 feet a second; a hurricane from 90 to 120 feet a second.

Regular winds are those which blow always in the same general direction. Such are the trade-winds (*q. v.*).

Periodical winds are those which recur at regular intervals. Among these may be mentioned the land and sea breezes of the seashore; the *sirocco* of Algeria, a wind which blows from the Sahara etc. Most of our winds are *variable*. See Cyclone, Monsoon, Storm, and Trade Winds.

Wind'sor Castle, the chief home of the English sovereigns, is at Windsor, a town on Thames River, 21 miles from London. As early as the time of the so-called heptarchy (*q.v.*) there was a stronghold there. Henry III built a round tower on the site, but it was wholly rebuilt by Edward III in 1342 as a meeting-place for his newly established order of the Knights of the Garter. He chose this spot because of the popular story that King Arthur used to sit here surrounded by his Knights of the Round Table. Henry III built many of the present walls and towers and two chapels, one of which Henry VIII gave to Cardinal Wolsey, who had a costly tomb erected there, and the chapel for a long time after was known as Wolsey's tomb-house. It is now called Albert Memorial Chapel. The magnificent chapel of St. George ranks next to Westminster Abbey as a royal burying-place. Among the many treasures in the royal library are a fine collection of drawings by the chief Italian painters and a series of 87 portraits, by Holbein, of Henry VIII's court. The royal forest of Windsor is one of the finest in England.

Windsor, Ont., Can., on Detroit River opposite Detroit. It has daily communication in summer with all lake-ports and ten-minutes' ferry-service to Detroit. It is the western terminus of the Grand Trunk, of the Ontario and Quebec division of the Canadian Pacific Railway and of the Canadian divisions of the Michigan Central and Wabash Railways. A tunnel under the river is now being constructed for trains *via* the Michigan Central across Ontario. Population 14,000.

Wind'ward Islands, the southern part of the Lesser Antilles, consist of Grenada, the Grenadines, St. Lucia and St. Vincent. They form the eastern barrier, from Martinique to Trinidad, of the Caribbean Sea. Each island has its own institutions, but they have a mutual court of appeals and unite for other purposes. Their area is 1,008 square miles; and population about 180,000. They belong to Great Britain. See West Indies.

Wine, the fermented juice of grapes. For winemaking, grapes are usually picked dead-ripe and sometimes are even allowed to wither, while some wines are made from raisins, and champagne and other kinds from grapes not quite ripe. In making the best wines great care is taken with the grapes, the unripe or faulty berries being picked off the bunches by hand and only the best bunches used. The grapes are put into the winepress, a large tub, and the juice pressed out by treading with the naked feet; or mechanical presses are used for this purpose. The juice runs through holes in the bottom of the press into a vat where it is left to ferment, this process lasting from a few hours to several days. This fermentation or "working" changes the sugar of the juice or "must" into alcohol and throws off carbonic acid gas. When the must has stopped frothing and become clear and cool, it is drawn off from the vat, or "racked," and put into casks, where a second fermentation takes place. In sweet wines or liquors not all the sugar is changed into alcohol; when all or most of the sugar is so changed, the wine is

called dry wine. When wines are bottled before fermentation is finished, they contain carbonic acid gas, which causes them to foam when uncorked. This gives the sparkle to champagne and other wines. The color of wine comes from the skins, white grapes yielding an amber-hued wine, dark grapes the rich color of claret and port. Logwood, burnt sugar etc. are also used to color wine. In the middle ages most of the wine drunk in Europe came from the Greek islands which grew the famous malmsey. Later the Rhine wines of Germany and the Burgundy wines of France became noted, and then began the vine-culture and wine-trade that have spread all over those countries. Their chief wines now are Bordeaux or claret, champagne, Burgundy, Hockheim and Moselle. The finest of the Hungarian wines is Tokay. Spain furnishes the sherry wines and Portugal port. One of the best of the many Italian wines is *Lachrymæ Christi*. Madeira has long been famous for its fine white wine. The Californian wines are the best in the United States, and amount to two thirds of the yearly output of the country. In 1906 the United States consumed 46,485,223 gallons of wine. In one year the world's estimated total production of wine was over 3,160 million gallons — France, Italy and Spain furnishing the bulk of this quantity.

Win'field, Kans., county-seat of Cowley County, on Walnut River and on the Atchison, Topeka and Santa Fé; St. Louis and San Francisco; and Missouri Pacific railroads, about 40 miles southeast of Wichita and 220 southwest of Kansas City. It is in a farming and stock-raising region, where there also is natural gas. Here are the Kansas Imbecile Asylum, St. John's College (Lutheran) and Southwestern College (M. E.). Winfield dates from 1870, and its industries consist of machine-shops, wagon-factories, a produce-packing plant, grain-elevators and flour-mills. It also has banks, schools, churches and weekly newspapers. Population 5,554.

Winkelried (*vĭn'kĕl-rēt*), **Arnold von,** a hero of Switzerland, the story of whose exploit is, after that of William Tell, the most popular in the early history of the Swiss. We are told how, at a critical moment in the great battle of Sempach, when the Swiss had failed to break the serried ranks of the Austrian knights, a man of Unterwalden, Arnold von Winkelried, came to the rescue. Entrusting his wife and children to the care of his comrades, he rushed toward the Austrians, gathered as many of their spears as he could against his breast, and fell pierced through and through; but into the gap thus made rushed the Swiss mountaineers and routed the Austrians. By the battle of Sempach (July 9, 1386) Switzerland gained its freedom.

Win'neba'go Lake, the largest in Wisconsin, is 28 miles long from north to south and about ten wide, and covers about 212 square miles. It is navigable, as is also Fox River, which carries its waters to Green Bay and Lake Michigan. For 15 miles along the eastern shore extends a rock-wall, in some places reaching hundreds of feet below the surface. Fond du Lac and Oshkosh border it.

Winnebagoes, a tribe of Indians belonging to the Dakota family, whose name means Men from the Salt Water. The French traders found them a large tribe in the Green Bay region of Wisconsin, and ruling over the neighboring Algonquin tribes. But in the beginning of the 17th century several banded tribes cooped them into one town, where 500 warriors died of want and sickness. The Illinois next attacked them, and at the end of the war the Winnebagoes were only a small tribe. They fought with the French against the English and with the British against the Americans. They were conquered by Gen. Anthony Wayne, and were among the tribes banded together by Tecumseh. They ceded their land in parcels, beginning in 1829. By 1846 they had been removed from Wisconsin, except a few who had taken allotments of land. After being sent to reservations in Iowa, in Minnesota and in Dakota, they were moved to Winnebago, Nebraska, and given in charge of the Quakers, who, as well as the Roman Catholics and the Presbyterians, established missions among them. They number about 2,000.

Win'nipeg, a large lake in Manitoba and Keewatin, about 260 miles long and six to 60 wide and covering about 8,500 square miles. It stands 628 feet above the sea; drains about 400,000 square miles; receives the waters of Lakes Manitoba and Winnipegosis, of the Lake of the Woods and of Red, Berens and Saskatchewan Rivers. It discharges its own waters through Nelson River into Hudson Bay. In winter the ice sometimes is five feet thick, and in the upper part does not disappear till June.

Winnipeg, Can., capital of Manitoba (*q. v.*) stands at the confluence of Assiniboine and Red Rivers. It practically is the gateway to the west of Canada, and is a metropolis of great promise. It originated in 1738 in Fort Rouge, which was followed in 1804 by Fort Montreal, in 1812 by Fort Douglas and in 1822 by Fort Garry. Colonization began with Fort Douglas, when the Scotch highlanders of Lord Selkirk founded a farming settlement on Red River. Fort Garry became the seat of government, and half a mile away grew up the village of Winnipeg. This was incorporated as a city in 1873, and covers the site of the old forts. Winnipeg is on the Canadian

Pacific, half way from Montreal to Vancouver, and also on the Canadian Northern. The first of these railways has six, the second four, branches to various points in Manitoba and the provinces adjoining. The Grand Trunk Pacific also makes Winnipeg its central point. There is steam navigation down Red River and up the Saskatchewan to the Rockies, 1,000 miles.

Winnipeg is the commercial metropolis of western Canada and the center of its jobbing and wholesale trade. It also is the financial headquarters. It exports more wheat than Duluth, Minn., and Chicago, Ills. The Saint Andrew waterpower on Red River and the Bonnet electric power-plant on Winnipeg River are making it a manufacturing center. Among the manufactures of the city are flour and oatmeal; bookbinding; clothing; brewing; furniture; harness and saddlery; carriages and wagons; soap, tanning and wooden goods; and many minor products. The city owns its asphalt plant, electric lighting plant, a quarry and waterworks, and has many fine parks and magnificent boulevards. The public buildings, among which should be mentioned those of the Manitoba legislature and the residence of the lieutenant-governor, would do credit to London. The school-buildings, numbering over 20 and costing $750,000, are unsurpassed in appearance and use. The Roman Catholics of the city also have parochial schools. Collegiate Institute, Manitoba Normal School, Carnegie Library and the University of Manitoba are the prominent institutions of learning. With the last are affiliated a College of Pharmacy, a Medical College, Manitoba College (Presb.), St. Boniface College (R. C.), St. John College (Anglican) and Wesley College (Methodist). The churches number 70, Winnipeg being as noted for the many religious bodies represented as for its numerous nationalities. The city has grown from 215 people in 1870 to 100,000 inhabitants in 1909.

Win'nipego'sis, meaning Little Winnipeg, a lake of Manitoba and Keewatin. It is about 125 miles long; its greatest width is 25 miles; and it covers about 2,000 square miles. It is 60 feet higher than Lake Winnipeg and 20 higher than Lake Manitoba, into which it discharges its waters by means of Water-Hen River. The waters of Dauphin Lake and Swan and Red Deer Rivers fall into Lake Winnipegosis.

Winnipiseogee (*win'e-pe-sā'ke*), a lake of New Hampshire, 25 miles long and about ten wide. There are a number of bays and many islands. Winnipiseogee or Winnepesaukee River carries its waters to the Merrimac. Its waters are clear, deep and well-stocked with fish.

Wino'na, Minn., county-seat of Winona County, the fourth city of Minnesota, on the Mississippi, 104 miles southeast of St. Paul. It is built on rich lowlands under the Mississippi bluffs. One of its finest buildings is the state's normal school. It also has a fine government building, magnificent library and Y. M. C. A. buildings and a water-front park second to none on the Mississippi. Winona is a large wheat and lumber mart, besides which it has manufactures of carriages, wagons, farm-tools, flour, shoes, candies, patent-medicines, a large malting plant and a flax or fiber plant. The city was settled in 1851. Population 21,000.

Wins'low, Edward, governor of Plymouth Colony, was born at Droitwich, Worcestershire, England, Oct. 19, 1595. He came to New England in the *Mayflower*, and offered himself to Massasoit, the Indian chief, as a hostage for the fair dealing of the colonists. In this way and by curing the chief when he was sick he gained his friendship. After two voyages to England on behalf of the colony, he was made governor in 1633, 1636 and 1644. On his third visit to England (1635) he was imprisoned for 17 weeks by Archbishop Laud for teaching in the church, as he was not a clergyman. Winslow's portrait in the gallery of the Pilgrim Society at Plymouth is said to be the only authentic likeness of any of the *Mayflower* Pilgrims. His marriage with Mrs. Susanna White was the first marriage in Plymouth Colony. In 1655 Cromwell sent Winslow on a mission to the West Indies, but he died on the voyage, May 8, 1655. Consult Justin Winsor's *Narrative History of the United States*.

Winslow, John Ancrum, American admiral, who in 1864, when in command of the *Kearsarge*, defeated and sank the Confederate privateer *Alabama* off Cherbourg harbor, was born at Wilmington, N. C., Nov. 19, 1811, and died at Boston, Mass., Sept. 29, 1873. Entering the United States navy in 1827, he served in the Mexican War and for gallantry was given command of the *Morris* and subsequently promoted to the rank of commander. After his encounter with Captain Semmes and the sinking of the *Alabama* (June 14, 1864), he was promoted to commodore and in 1866-7 commanded the Gulf squadron. In 1870 he received a rear-admiralship, and was given command of the Pacific squadron (1870-2).

Win'sor, Justin, American historian and librarian, was born at Boston, Mass., Jan. 2, 1831, and died at Cambridge, Mass., Oct. 22, 1897. After studying at Harvard and at Heidelberg, he became superintendent of Boston Library and held this post from 1868 to 1877, passing in the latter year to the librarianship of Harvard. From 1876 to 1886 he was president of American Library Association and of the American Historical Association, and was secretary of the Massachusetts Historical Society.

He was a large contributor to the periodical press and an extensive and instructive author. His chief publications embrace *The Readers' Handbook of the American Revolution*, *Bibliography of Original Quartos and Folios of Shakespeare*, *Christopher Columbus, Cartier to Frontenac* and *Narrative and Critical History of America*. He also edited the *Memorial History of Boston*.

JUSTIN WINSOR

Wins'ton, N. C., a city and manufacturing center, the capital of Forsyth County, adjoining the city of Salem, in the northwestern portion of North Carolina. It is on the Southern Railroad and the Norfolk and Western Railroad, 27 miles west of Greensboro and 120 northwest of Raleigh. It has a number of tobacco-factories and warehouses, iron-works, cotton and woolen mills, carriage and wagon factories and shuttle and bobbin works. Population of Winston-Salem 13,650.

Win'ter, William, American poet, essayist and dramatic critic, was born at Gloucester, Mass., on July 15, 1836, and in 1857 graduated from Harvard Law School. His tastes inclining him to literature, he abjured law and wooed the Muses, publishing two collections of verse entitled *The Convent* and *The Queen's Domain* and other poems, besides lecturing occasionally. Removing to New York in 1859, he became literary editor of *The Saturday Press* and assistant-editor (1861-5) of *Albion*, and then transferred his pen to *The Tribune* for which he has long been dramatic critic, as well as a writer of literary essays, and a contributor of historical and other articles and addresses and a biographer of actors. His published work is considerable, and ever reveals the practised *littérateur* and a writer of culture and charm. His later volumes of verse include *My Witness*, *Thistledown* and *Wanderers*. Of actors and theatrical folk he has treated in *Henry Irving; The Stage-Life of Mary Anderson; Life and Art of Edwin Booth*; *Life and Art of Joseph Jefferson;* and *Shadows of the Stage*. Other books include *Shakespeare's England*, *Gray Days and Gold* and *Brown Heath and Blue Bells*. He has also edited the work of a number of contemporary players including those of Brougham, Arnold and O'Brien, besides *The Plays of Edwin Booth*.

Winter's Tale, The, is a drama of Shakspere which certainly was acted as early as 1611, although it was first printed in the folio of 1623. The plot of the drama closely follows that of Rob Greene's *Pandosto*, a novel of the type of Lodge's *Rosalind*. The drama is loftier, calmer and maturer than the novel; and skillfully contrasts the nobility and dignity of the unjustly suspected Hermione with the insolence, tyranny and jealousy of Leontes.

Win'throp, John, governor of Massachusetts colony, was born at Groton, Suffolk, England, Jan. 12, 1587. He became a lawyer, and because of his good and religious character he was chosen governor by the Massachusetts Bay Company in 1629. The next year he came over, bringing 900 emigrants. He was generally re-elected every year throughout his life, except from 1634 to 1636, when he was deputy under Sir Harry Vane. His influence in the colony was very great, and through it on the life, thought and later politics and institutions of New England. Winthrop's *Journal* is one of the most important sources of early American history. John, his son, was governor of Connecticut. Governor Winthrop died at Boston, March 26, 1649.

Winthrop, Theodore, an American author, was born at New Haven, Conn., Sept. 22, 1828. He graduated at Yale College in 1848. He then entered business in New York, spent two years at Panama and opened a law-office at St. Louis. On the outbreak of the Civil War he enlisted, and was one of the earliest martyrs of the struggle, being shot while leading a charge at Big Bethel, June 10, 1861. He was hardly known as a writer till the appearance in *The Atlantic Monthly* of his life-like sketches of *Washington as a Camp*, describing the march of his regiment, the famous New York Seventh, and its first quarters in the capitol at Washington. Soon after his death his novels were published from manuscript, and his magazine stories reprinted. *Cecil Dreeme*, *John Brent* and his other novels have a breezy, outdoor air that is delightful, while the short story, *Love and Skates*, is an English classic.

Wire, a thinly or, according to the ductility of the metal of which it is made, a more or less attenuated thread or rope, the product of iron, steel, brass, copper, aluminum or platinum in almost universal use for netting, fences, piano-strings, bed-springs, the telephone and the telegraph. Wire is believed to have been in use as early as 700 or 800 B. C. by the people of Egypt and Nineveh; and though in modern times, in use in Britain and Europe, made of strips of hammered metal, the machine-drawn wire is a product only of the last 40 or 45 years. Bessemer steel is the chief metal used for most purposes of wire-making, the process of manufacture being to form steel billets into round rods, which then go through several processes

of drawing by means of holes in a draw-plate of varying diameter, when it is cleaned and wound upon drums. In the process of drawing, the wire frequently has to be freshly annealed; while for many purposes, as piano-wire and the spokes of bicycles, the material used has to be a highly-tempered steel. The wire used for bed-springs is chiefly of brass, since it does not rust from moisture as iron does. For cooperage purposes, in connection with wooden hoops in strengthening barrels, the wire used is coppered steel. Telegraph and telephone wire is now made of a bimetallic wire, combining steel for strength and iron or copper for conductivity.

Wirt, William, was born at Bladensburg, Md., Nov. 8, 1772. He began to practice law in 1792 at Culpeper Court House, Va., but within a few years moved to Charlottesville and thence to Richmond. In 1803 appeared his *Letters of a British Spy*. He took part in the prosecution of Aaron Burr, and was attorney-general of the United States from 1817 to 1829. In 1832 he ran for the presidency on the ticket of the anti-Masonic party. Wirt is now best remembered as the author of the famous *Life of Patrick Henry*. He died at Washington, D. C., Feb. 18, 1834. Consult *Life* by J. P. Kennedy.

Wiscon'sin, a north-central state of the American Union, whose area, including Apostle Islands at the western end of Lake Superior and the islands at the mouth of Green Bay in Lake Michigan, is 56,040 square miles, its length being 300 miles, while its greatest breadth is 290 miles. It is bounded on the east by Lake Michigan, on the south by Illinois, on the north by Lake Superior and upper Michigan and on the west by Minnesota and Iowa, the greater part of the latter boundary being formed by the Mississippi River.

Cities and Population. Its capital is Madison (population 24,300). The other chief cities are Milwaukee (355,000); Superior (36,550); Racine (32,290); Lacrosse (29,080); Oshkosh (30,575); Sheboygan (24,026); Green Bay (22,855); Eau Claire (18,740); Marinette (15,360); Fond du Lac (17,285); Appleton (17,000); Ashland (13,074); Janesville (13,887); Wausau (14,879); Manitowoc (12,922); Kenosha (17,061); and Beloit (13,339). The population of the state was estimated in 1908 to be 2,275,000. Foreign nationalities are largely represented, the larger number being German and Poles (German, Austrian and Russian); while there are many Bohemians, Norwegians, Danes, Russians, Austrians, Irish, English and Scotch besides English and French Canadians. Denominationally the Roman Catholics are the leading church; the other churches embracing Lutherans, Methodists, Baptists, Congregationalists and Presbyterians. The Indians number 10,957.

Surface and Climate. Wisconsin consists, in the main, of a level or gently undulating plain, sloping slightly on either side of a height of land (1,500 feet in elevation) and running southward about the middle of the state; while in its northern section there is a line of low-lying hills, the Penokee Range, stretching parallel with Lake Superior and about 30 miles south of it, thence trending northeastward into the northwestern peninsula of Michigan and cutting off the northeastern corner of Wisconsin from Lake Superior. The chief drainage on the west and northwest is by St. Croix, Stillwater, Chippewa, Black and Wisconsin Rivers into the Mississippi: the Menominee, Oconto and Fox (the latter draining Lake Winnebago) fall into Green Bay; and Milwaukee River into Lake Michigan. Rock and Desplaines Rivers flow south into Illinois. Wisconsin has a continental climate, with a rather long and severe winter, though the extreme heat of summer is tempered by the influences of the lakes on its northern and eastern flanks. While there is considerable forest, the cultivated region is large and the land fertile, most of the surface being covered by the clay gravel, marl and sand of the glacial drift, with a fairly deep layer of rich vegetable-mould.

Natural Resources. These consist of the product of the forest, the mines and the agricultural lands. The yield in 1907 of the chief cereals was as follows: oats, 51,700,000 bushels; corn 46,688,000; wheat 2,955,000. Barley yielded 18,423,000 bushels, potatoes 22,750,000 and hay 3,105,000 tons. The chief timbers are white pine, hemlock and spruce, though the extent of the cuttings of these has largely denuded the forests. There still are considerable limestone, sandstone and granite in the quarries while the yield from bricks, tiles and other clay-products continues to be large. The iron in the mines principally is red hematite, of which there was an output in 1906 of 848,133 long tons. Mineral waters, moreover, are a valued product, yielding $2,422,694 in 1906. In addition to the agricultural operations and the resources from husbandry, stock-raising is largely carried on. The number of dairy-cows in Wisconsin in 1907 was 1,365,000; while of other cattle there were 1,148,124 head. Of horses there were 637,500, of sheep 1,023,933 and of swine 1,873,206. The dairy products in 1905 reached $29,-994,791.

Manufactures. The state's development as a manufacturing one is creditable to the enterprise and industrial activities of its people. There is room for increase, if we may judge from the volume of capital invested (in 1905 this was $416,447,051),

which places Wisconsin in the seventh rank among manufacturing states. In 1905 the wage-earners numbered 151,391, and the amount paid them was $71,471,805; while the value of the products was $411,-139,681. Lack of coal is a drawback to industries; but in spite of this lack the extent, variety and value of its manufactured commodities are phenomenal. This is explained in part by large natural resources of timber, agricultural, cattle and dairy-products, its great wool-clip and the mineral ores, in addition to extensive water-power and general manufacturing facilities, with the aid given by financial wealth and banking resources and the further aid afforded by its transportation facilities, both by land and by water. Foundry and machine products in 1905 were worth $29,908,001, while of like value were the gross flour and grist-mill products and the yield from the manufacture and sale of malt liquors. The yield from leather, tanned, curried and finished, was close upon $25,850,000; while the trade in cattle-slaughtering and meat-packing yielded over $16,000,000; planing-mill products had a gross return of over 11 millions. Even tobacco was grown to the extent of 38,-610,000 pounds in 1907. Agricultural implements in 1905 netted in excess of 10 millions; carriages and wagons 5½ millions; men's clothing 6½ millions; boots and shoes 6½ millions; printing and publishing 7½ millions; paper and wood-pulp nearly 18 millions; and railroad construction material and repairing netted 6½ millions of dollars.

Commerce and Transportation. Banking facilities have helpfully increased in the past few years; while the gross deposits show the prosperity and thrift of the people. In 1905 Wisconsin had 119 national and 380 state banks. The former had over 15 million dollars of capital, and the latter an excess of 10 millions; while the aggregate deposits in the national institutions were close upon 100 millions, and in the state banks close upon 79 millions. There also were a large number of private banks and nine or ten loan and trust companies, each with considerable deposits.

The total railway mileage on June 30, 1905, was 7,211 miles, distributed among the following chief lines: the Chicago, Milwaukee and St. Paul; Chicago, Burlington and Quincy; Chicago and Northwestern; Great Northern; Minnesota, St. Paul and Sault Ste. Marie; Illinois Central; Wisconsin Central; Northern Pacific; and Duluth, South Shore and Atlantic (Canadian Pacific) railroads. Besides these facilities are those by steam-vessels on Lakes Michigan and Superior, in addition to the transportation *via* the Mississippi, Wisconsin, Fox and Chippewa Rivers, not to speak of the canal connections between Portage and Fox River. The assessed valuation of property in 1905 was $1,384,-580,755. The state's debt, incurred mainly during the Civil War, amounted to 2¼ millions; and its expenditure was about a like sum.

Education. Wisconsin is far-sighted enough to see the advantage of dealing liberally with education. In 1905 its expenditure for public schools exceeded $8,180,000, including the amount appropriated for the maintenance of the state's normal and the counties' training-schools for teachers. Out of a school-population of 766,550 in 1905 the enrolled numbered 460,000 and the daily average attendance was about 288,400. The number of teachers was about 13,675, the bulk of whom were women. There were over 200 free high schools, with a gross enrollment of 18,200. Higher education is represented by the University of Wisconsin, at Madison, with 354 instructors and 4,000 students; by Lawrence University (undenominational), at Appleton, with 33 instructors and 561 students; by Beloit College (Congregational), with 35 instructors and 381 students; by Ripon College (Congregational), with 24 instructors and 245 students; by the Northwestern University, a Lutheran institution at Watertown, with 10 instructors and 259 students; by Marquette University (Roman Catholic), at Milwaukee, with 81 instructors and 630 students; by Concordia College (Lutheran) at Milwaukee; and by Milton College (Seventh Day Bap.), with 13 instructors and 151 students. The state also maintains industrial schools for children of both sexes, schools for the deaf and the blind, homes for the feeble-minded and insane and hospitals, reformatories and penitentiaries.

History and Government. From an early period the region was the theater of mission work undertaken by French-Canadian priests and of the discoveries of gentlemen-explorers from New France, as well as the fur-trading and trapping ground of French-Canadian *coureurs des bois.* They came thither from Quebec by way of Ottawa River, Lake Nipissing, Rainy River and the Great Lakes, thence *via* Sault Ste. Marie to Marquette and Duluth on Lake Superior or *via* St. Ignace to Green Bay on Lake Michigan. These expeditions date as far back as the era of Champlain, governor of New France in 1633-5, and among them numbered Nicolet, the first white man, it is believed, to visit Green Bay, and the fur traders, Radisson and Groseilliers, supposed to have discovered the upper Mississippi in 1659. In 1665 Father Allouez established missions at La Pointe and on Fox River; he was followed about 1673 by the explorers Louis Joliet and Père Marquette, the latter proceeding by

canoe south from Green Bay as far as the site of Chicago. Du Luth is another adventurer of the time, his name being perpetuated in that of the city of Duluth; after him came Charles De Langlade, who took part in the French and Indian War of his era and allied himself with the British in the War of the Revolution. In the War of 1812 the French, associated with the Indians, took the British side in the struggle and even made a raid on Prairie du Chien on the Mississippi, capturing its American garrison. Meanwhile the fur-trade was being prosecuted, and immigration slowly began to enter. For the protection of the newcomers and to assist the national authority forts began to be built and garrisoned, especially Fort Howard on Green Bay and one at Prairie Du Chien. Internal development followed, particularly after the discovery of the lead-mines at Potosi and Mineral Point, though the country was periodically disturbed by trouble with the Indians of the region — Sacs, Foxes, Sioux, Chippewas and Winnebagos. An incident in the disaffected condition of the native tribes was the Black Hawk War of 1832, which was presently put down, while the Indians were removed to and protected on new reservations. About the close of the 18th century efforts were made to organize the region as a territory, though it passed through many vicissitudes, being at first part of the Northwest Territory, subsequently oscillating in its attachment to Indiana, to Michigan and to Illinois and then back to Michigan again. Finally in 1836, on the admission of Michigan as a state, Wisconsin, with parts of Iowa, Minnesota and the Dakotas, was erected into a territory, Belmont and Burlington successively being the capital. For 12 years it remained a territory, being shorn meanwhile of parts of its assigned limits; in May, 1848, however, it was admitted into the Union under its first constitution, Madison becoming the capital. About this period, owing to the revolutionary upheaval in Europe, the state received large additions of Germans to its population, while later it took a helpful and patriotic part in the Civil War, furnishing a total contingent of over 90,000 men. The state in 1871, 1894 and 1908 suffered from destructive forest-fires. Its local legislature consists of a senate of 33 members, elected every fourth year, and an assembly of 100 members, returned biennally. It sends 11 representatives to the lower house of Congress. Its executive officers are elected for two years each. The judicial power is vested in seven supreme-court and 18 circuit-court justices. Consult Thwaite's *Story of Wisconsin*, Strong's *Histories of the Territories of Wisconsin*, Legler's *Leading Facts in the History of Wisconsin* and Hebberd's *Wisconsin under the Dominion of France*.

Wisconsin River, a branch of the Mississippi, rises in Lake Vieux desert on the northeastern border of Wisconsin, flows south 600 miles, and falls into the Mississippi four miles below Prairie du Chien. It is navigable for steamboats for 200 miles to Portage, where it is joined by canal to the Fox, thus making a waterway across the state from Lake Michigan to the Mississippi by way of Green Bay, the Fox and the Wisconsin.

Wisconsin, University of, at Madison, Wis., was chartered in 1848, and opened in 1849. It was reörganized in 1858, but during 1861-5 so many of its students entered the Federal army that in 1864 commencement could not be observed, In 1866 came another reörganization, and since then progress has been unbroken. The university received its national grant for founding colleges of agriculture and industrial arts; opened the regular collegiate course to women; and later established coëducation in every department. The university is the crown of Wisconsin's public schools, and graduates from the high schools do not have to pay for tuition in it. Since 1892 special courses of every kind have been added, and the post-graduate students have greatly increased in number. The university consists of the college of letters and sciences; the college of mechanics and engineering; the college of law; the college of agriculture; and the graduate school. In addition, there are a summer-school and a university-extension. The scientific and literary college offers courses not only in history, languages and sciences but in astronomy, commerce, education, home economics, medicine, normal studies and music. The college of agriculture includes the Wisconsin agricultural experiment-station, and organizes farmers' institutes. There are 26 scholarships, eight of which are for undergraduates; 31 fellowships; and four funds for loans to students. Military drills and gymnastic work are required studies for men during part of the course; but only gymnastic work for women. There are five literary and two debating societies. There also are numerous special associations. The libraries of the university and of Wisconsin Historical Society are particularly rich in works on American and English history, the Greek language and literature, the publications of learned societies in the United States, political and social science and Shakespereana. In 1908 the faculty numbered 354, the students 4,000 and the library (of the university) 122,000 volumes, while other libraries put 128,000 more at the command of the university. The state appropriates funds annually to the university. In 1907 its

productive funds amounted to $591,623 and the income, including appropriations from the state, was $1,124,731. In scholarship, as in numbers, the university stands in the front rank of American colleges.

Wise, Henry Alexander, an American statesman, was born at Drummondtown, Va., Dec. 3, 1806. He graduated at Washington College, Pennsylvania, and studied law. He became prominent in politics, advocating the nomination of Jackson at Baltimore and favoring the doctrine of states' rights. He was sent to Congress in 1833, where he went over to the Whig party, in opposition to Jackson's course. Under Tyler, whose nomination Wise had secured, he had a strong influence and was made minister to Brazil. In 1854 he became governor of Virginia. In December, 1859, he signed the death-warrant of John Brown (*q.v.*). Though making an effort for peace as a member of the Virginia convention, he went with his state into secession, and became a brigadier-general in the Confederate army. He served in the Kanawha valley and at Roanoke Island. Here his forces were captured and his son was killed. He wrote *Seven Decades of the Union.* He died at Richmond, Va., Sept. 12, 1876.

Wise'man, Nicholas, cardinal and Roman Catholic archbishop of Westminster, was born at Seville, Spain, of Irish parents, Aug. 2, 1802. He studied in Ireland and at Rome, where his brilliant course secured him in 1823 the appointment of vice-rector of the English College, which in 1828 was changed to rector. In England he first became known by lectures on the doctrines of the Roman church, which were followed by the founding with Mr. O'Connell of *The Dublin Review.* His appointment as archbishop of Westminster and cardinal produced great excitement, as it was looked upon as an effort of the Roman church to recover possession of England, where there had been no Roman Catholic bishops since the reign of Elizabeth. Wiseman's addresses and publications did much to allay the excitement, and his ability and moderation as well as his literary position won the admiration of all. He wrote on literature and art besides his religious works. *Influence of Words, Lectures on Religion and Science, Points of Contact between Science and Art, Fabiola* and *The Real Presence* were books that obtained a large circulation. He died at London on Feb. 15, 1865.

Wista'ria, a class of climbing plants named after Professor Wistar of Philadelphia. The leaf is formed of from nine to 15 oval leaflets, and the flowers, usually lilac in color, grow in thick, long clusters and resemble the flowers of the locust-tree or sweet peas or other plants of the *Leguminosæ* or bean family, to which it belongs. The seeds or beans are found in long pods. It grows rapidly, often 20 feet in a season. The Chinese wistaria, introduced from Japan, blooms earlier, with a looser cluster of flowers, of a paler lilac or white. There are several other varieties, including a double-flowered one.

Wis'ter, Owen, American author and story-writer, was born in Philadelphia, Pa., on July 14, 1860. He is a grandson of Fanny Kemble, the actress. He graduated in 1882 from Harvard. He subsequently passed through Harvard Law School, was admitted (1889) to the Philadelphia bar, but two years later took to a literary career, chiefly writing stories of western life and character. Besides contributing articles to The American Sportsman's Library on the bison, musk-ox, sheep and goat, Mr. Wister's other well-known works embrace *Oliver Wendall Holmes* in the American Men of Letters Series and *Benjamin Franklin* in the English Men of Letters Series. His other writings include *The Dragon of Wantley; Red Man and White; Lin McLean; U. S. Grant; The Virginian; Journey in Search of Christmas;* and *Lady Baltimore.*

Witch and Witch'craft. The names witch and wizard are given to persons supposed to possess unusual powers, popularly thought to have been acquired by a compact with Satan. The belief is an old one, as the Witch of Endor is said to have raised Samuel for Saul in the early days of the Jewish nation, and Paul had several contests with sorcerers. Sorcerers, soothsayers, diviners and magicians often were popularly classed together and with witches; but the magicians claimed to be a distinct class, using their knowledge of the secrets of nature for the benefit of mankind, while the witches and sorcerers delighted in doing harm. The belief in evil spirits has been common in every nation and country, and the legends of a people are full of the deeds of supernatural beings. In popular belief a witch usually was an old woman, who rode on a broomstick through the air by night to attend the witches' gathering and delighted in acts of spite and meanness. Their victims, on whom they had cast the evil eye, pined away mysteriously or were troubled by strange noises and curious losses. The witches' mark was a spot of some kind made on the body by the devil as a sign of his bargain, and was indelible. It was sought for by the class of inquisitors known as the witch-finders. Shakespeare's *Macbeth* and other plays, Burns' *Tam O'Shanter* and the *Walpurgis Night* in Goethe's *Faust* give an idea of these popular beliefs.

The belief in witchcraft as the work of evil spirits led to the bloody and cruel persecution and punishment of witches which lasted in Europe for four centuries. In these, it is estimated, 9,000,000 persons were put to death. The bull of Pope Innocent VIII in 1484 began the work of destruction, in which confession was ex-

tortured by torture and the testimony of enemies and children accepted. In one year, in the district of Como, 1,000 persons suffered as witches and 500 in three months in Geneva, while 4,000 persons perished in Scotland, and during the session of the Long Parliament (1640-52) 3,000 persons were condemned in England. The delusion was almost universal, such a judge as Sir Matthew Hale giving sentence against a suspected person and a physician as eminent as Sir Thomas Browne declaring his belief in witchcraft, in spite of having written a volume on *Popular Fallacies*. The last execution in England was in 1716, and the laws against witchcraft were repealed in 1735. The last execution on the European continent took place in Posen as late as 1793. The persecution of supposed witches in Salem, Mass., was a result of the general belief so common at the time. Cotton Mather, in 1685, published an account of cases of witchcraft and made experiments on suspected persons, by which he learned that the demons understood Latin, Greek and Hebrew well but Indian dialects only imperfectly. He wrote *Wonders of the Invisible World* to convince doubters, and his book received the recommendation of the governor of the colony and the president of Harvard College. Nineteen persons were hanged between June and September of 1692. Consult Poole's *Cotton Mather* and Upham's *Salem Witchcraft*.

Witch'-Ha'zel, the name of a small tree or shrub belonging to a family of which there are several species, among them the liquid-amber, a forest tree. The witch-hazel grows in damp woods about ten feet high, has leaves much like the hazel, with clusters of three or four bright yellow flowers which appear in the fall. The fruit is a pointed, two-celled pod, which does not ripen until the next summer. The wood is white, the bark and leaves contain tannin, and an extract of the bark and leaves is used as an external application in medicine. The name of witch-hazel comes from a popular belief that a green branch held in the hands will turn toward the ground to indicate a hidden supply of water or of gold.

Wit'te, Sergei Julievitch, a Russian statesman, born at Tiflis, June 17 (Old Style; July 29, New Style), 1849. His father was of modest German extraction, but his mother was descended from the princely Dolgoruki family. From earliest childhood he was instructed at home by the best teachers in Tiflis, even while he studied at the classical gymnasium; he grew up a true Christian, a Russian in soul and mind. He completed his education in scientific lines at Odessa; and although, by birth, by the station of his relations, by education and by natural endowments he could always count upon a successful public career, he connected himself with the steamship and railroad company then under the supervision of Admiral Chikhchov. At the same time he entered the government service in the office of Governor Kozebu. He distinguished himself in the Russo-Turkish War of 1877-8 by his achievements in military transportation. This gained him the position of Minister of Ways of Communication, and in 1896 he was promoted to the head of the financial ministry. He has applied his principles of economy to the development of Russia, including protection, and to the exploitation of mines. He is credited with having inaugurated the plan for the Trans-Siberian Railway (*q. v.*). He possessed the confidence of his sovereign, the esteem of the outside world and, especially, the full reliance of foreign financial communities. The brilliant success of the Russian war-loan was mainly due to Count Witte. He was the head of the Russian embassy at Portsmouth (1905) to formulate a treaty of peace with Japan, a task which he accomplished in spite of the Russian government. He urged the Czar to call the *Duma*. In 1905 he became prime minister, but retired in May of 1906 rather than be associated with the party of reactionaries. At Algeciras he reinstated Russia into the place of influence she had temporarily lost in the councils of Europe. He may be ranked as the most sagacious statesman and skilfull diplomatist of Russia to-day.

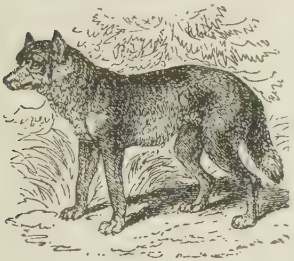
Wittenberg (*vĭt'tĕn-bĕrg*), a town of Prussian Saxony, is on Elbe River, 45 miles southeast of Magdeburg. It is famous as the home of Luther and Melanchthon, whose tombs are in the church on the doors of which Luther nailed his famous theses. The church was restored, and in 1858 new bronze doors with the theses in Latin were erected. In another church are two pictures: one of Luther preaching, the other of Melanchthon administering the communion. The houses of Melanchthon and Luther are still shown, Luther's containing his chair and table and two portraits of himself; and in the market-place is a bronze statue of him. The university where Luther was professor and where, according to Shakespeare, Hamlet studied, has been removed to Halle. Wittenberg has manufactures of woolen and linen goods, hosiery, leather, brandy and beer. Until 1422 it was the residence of the dukes and electors of Saxony. In 1547 it was taken by Charles V and in 1760 by the Austrians, when nearly one third of it was destroyed. Napoleon captured it in 1806 and fortified it in 1813, the Prussians finally capturing it in 1814. Population 18,340.

Wo'burn, Mass., a city and manufacturing center in Middlesex County, eastern Massachusetts, on the Boston and Maine Railroad, ten miles northwest of Boston. The chief

industry is tanning and dressing leather and manufacturing boots and shoes; there also are glue-factories and chemical works. The town has good schools, churches and a well-equipped public library. Population 14,432.

Wolcott (*wōl'kŏt*), **Roger,** a governor of Connecticut, was born at Windsor, Conn., Jan. 4, 1679. He was in service in the attack on Canada in 1711 and at the siege of Louisburg in 1745. He was governor of Connecticut from 1751 to 1755, and had already been a member of the assembly and of the council, a judge and deputy-governor. He published poems and a history in which is an account of the Pequot war. He died on May 17, 1767.

Wolf, a carnivorous mammal belonging to the dog family. The domesticated dogs are very likely descended from wolves. The latter have a wide geographical range, being found over nearly the whole of Europe, Asia and North America. There are none in South America or Africa, the jackal and foxes apparently taking their place in those countries. Wherever found near inhabited regions, they prey upon sheep, which they run down in open chase. Assembled in packs, they also attack herds of cattle; and, when bisons were abundant on the western plains, they would overcome those large animals. They are characterized by cunning, cowardice and cruelty; they keep well out of the sight of man; will forsake their cubs in time of danger; make a practice of killing and devouring their wounded; and eat their own dead. Centuries ago wolves were abundant in the British islands, but they were hunted by the ancient Britons, and at different times a reward was offered for their heads and skins. As a result they were exterminated. They became very scarce in the 16th century, and by the middle of the 18th century were exterminated in England, Scotland and Ireland. In America the common wolf and its varieties extend from Greenland to Mexico. They are about 65 inches long, with a tail of 15 inches. They vary in color, but are chiefly gray, becoming whitish in the north and dark in the south. In Florida there are black wolves and in Texas red ones. The gray wolf, often called timber-wolf, is a formidable creature, large and robust. They have been persistently hunted, a high bounty placed on them, but are a pest still on the cattle-plains. Their cry is a prolonged howl, blood-curdling and mysterious. The coyote is a smaller wolf, peculiar to the United States. It is common on the western plains, having its den in holes in steep banks and in "washouts." It reaches a length of about 55 inches, and is yellowish gray, clouded with black. It steals poultry, pigs, lambs and sheep, but feeds chiefly on prairie-dogs, ground-squirrels, rabbits, hares and sage-grouse; will attack deer and the prong-horned antelope. Its cry is between a howl and a bark. Wolves do not sleep in winter as does the bear, but hunt throughout the cold days. See Dog and Jackal.



COMMON WOLF

Wolfe, Charles, a British poet, was born at Dublin, Dec. 14, 1791. He graduated at Trinity College, Dublin, and was a curate in Tyrone County. He is famous for his ode on the burial of Sir John Moore, beginning with the words: "Not a drum was heard, not a funeral note," which is known to every schoolboy. He died at Cork, Feb. 21, 1823.

Wolfe, James, an English general, was born at Westerham in Kent, Jan. 2, 1727. When only 13, he was prevented by sickness from going with his father, a British officer, on the expedition to Cartagena. In his first service in Flanders he took part in the famous battle of Dettingen, and in Scotland was at the battles of Falkirk and Culloden. His conduct while in charge of a regiment in Scotland and in the expedition against Rochefort in 1757 won him the rank of colonel and gave him the command of a brigade in the expedition against Cape Breton. His skill and bravery at the attack on Louisburg won him the title of Hero of Louisburg. In the effort to drive the French out of Canada Pitt (Earl of Chatham) gave the charge of the invading army to Wolfe, who had been made major-general. The story of his attack on Quebec, how he scaled the cliffs with his army by night, and died in the moment of victory, while his brave antagonist, Montcalm, dying too, said: "It is a great consolation to have been vanquished by so brave an enemy," is well-known. He died on Sept. 13, 1759. Consult *Life* by Wright and *Montcalm and Wolfe* by Parkman. See Canada, England, France and Quebec.

Wolseley (*wŏŏlz'lĭ*), Viscount **Garnet Joseph,** G. C. M. G., P. C., etc., field-marshal and lately commander-in-chief of the British army, was born near Dublin, June 4, 1833, and was educated under tutors. He entered the English army in 1852 and served successively in the Burmese War and Crimean War, and was severely wounded at the siege of Sebastopol. He subsequently served in India and China and in 1867 in Canada, where he acted as deputy-quartermaster-general and commanded the expedition to Red River, Manitoba. In 1873 he commanded the troops on the Gold Coast of Africa during the Ashanti War, and entering Kumasi received the submission of

the king. For this campaign he received the thanks of Parliament and a gratuity of £25,000 "for courage, energy and perseverance." He also received the freedom of the City of London and a sword valued at 100 guineas ($525). In 1875 he was governor of Natal; in 1880 quartermaster-general of the forces; and from 1882 to 1885 was adjutant-general. In 1882 he was in command of the expeditionary force in Egypt and of the Gordon relief expedition. Subsequently he was commander of the forces in Ireland, was raised to the rank of general (1882) and field-marshal (1894), and from 1885 to 1900 was commander-in-chief of the army. He is the author of a *Life of Marlborough*, of *The Decline and Fall of Napoleon* and of *The Soldier's Pocket-Book for Field-Service*.

LORD WOLSELEY

Wolsey (*wo͝ol'zĭ*), **Thomas,** an English cardinal, was born at Ipswich in Suffolk in March of 1471. He secured an education at Oxford, and became rector at Lymington. Through the influence of a friend he was made chaplain to Henry VII, with whom he became a favorite, and was appointed dean of Lincoln. When Henry VIII became king, Wolsey governed the kingdom. Honors were showered upon him. He was made bishop of Lincoln, archbishop of York and cardinal. In 1515 he was prime minister and lord high chancellor. He was successful in command of the royal army at Tournay, and effected a treaty in 1514 with Louis XII of France, which left England the first power in Europe. His income was enormous, and large sums were used in founding a college at Ipswich and Christ Church College at Oxford. Wolsey's efforts to obtain Pope Clement VII's permission for Henry's divorce of Queen Catherine were unsuccessful and lost him the royal favor, which alone had stood between him and those whom his splendid living and overbearing conduct had made his enemies. Anne Boleyn, whose marriage to the king he had opposed, with Norfolk her uncle, plotted his ruin. He was driven from court to his diocese in York, where he won the hearts of the people by his gracious manner. The king, too, showed signs of relenting, and his enemies, alarmed, had him arrested for high treason, but he died at Leicester Abbey on his way to London, Nov. 29, 1530. Consult Shakespeare's *Henry VIII* and Froude's *History of England*.

Wolverhampton (*wo͝ol'vẽr-hămp'tŭn*), a market-town of Staffordshire, England, is 13 miles northwest of Birmingham, on a height which commands a fine view toward Wales. The old church was founded in 996 and the free grammar-school in 1515. There are a corn-exchange, market-hall, agricultural hall, public baths, a free library, a cattle-market covering five acres and a large park. It is famous for the manufacture of hardware, especially iron implements, tools, locks, hinges, nails and kitchen furniture. It also has smelting-furnaces, iron and brass foundries, chemical works, dye-works, rope-walks, varnish-works and breweries. The town was named Wulfrunahamton in honor of Wulfruna, sister of Ethelred II, who founded the church and college in 996. Population 94,187.

Wol'verine', a carnivorous animal of the northern forests of Europe, Asia and America. There is only a single species. It is a member of the marten family, a member notorious as a glutton and a pest. It is remarkably cunning and a very successful thief. The trapper hates it, for again and again it will steal his bait and his capture. It will raid cabin and camp, destroying in wholesale fashion, seemingly from pure malice. The American form is about the size of a bull-dog. It has paws similar to those of a bear; the body is covered with shaggy hair of a blackish color, with pale bands along the sides of the body and one on the forehead. The body and limbs are stout, and the animal resembles a small bear. It climbs trees, and during the breeding-season forms burrows for the mother. It feeds on squirrels, hares, foxes, grouse, reindeer and other animals. Michigan is called the Wolverine State from the occurrence of the wolverine in its forests. The animal is found in the northern Cascades, in the Rockies as far south as Great Salt Lake and in arctic America, abounding in portions of Alaska.

Wom'an's Chris'tian Tem'perance Un'ion. See TOTAL ABSTINENCE.

Woman's Relief-Corps, a patriotic society, dating from 1883, whose aim is to perpetuate the memory of the dead soldiers of the Civil War and to care for their dependents. The society, which has 150,000 members, has, it is said, expended over two million dollars in its aid to needy women and orphans of Union veterans. Like the Grand Army, after which it in part is modelled, it is divided into 35 or 40 departments and into lesser divisions termed corps, of which there are over 3,200. The order meets annually.

Women's Clubs, organizations which have largely grown out of reading-circles, for religious, philanthropic, educational and social purposes. They have become a marked feature of women's life and career in this and other countries in the past 25 years. The impulse, in a large degree, was given to the founding of these organizations by the establishment in New

York City, in 1868, of the Sorosis Club under Mrs. J. C. Croly (Jennie June), Mrs. James Parton (Fanny Fern) and other ladies of high literary and social position. A further impulse was given by the founding, in New York City also, in 1873, of the Society for the Advancement of Women, of which Mrs. Julia Ward Howe for many years was president. Still later came The General Federation of Women's Clubs, first projected in 1890, an organization which has spread widely over the country. To-day it is understood to have close upon 50 federations in the different states, embracing about 4,500 clubs and nearly 275,000 members. Many of the organizations under the Federation have taken up special lines of work, as visiting the public schools to establish school-libraries or kindergartens, to urge the study of household economies and in general to reform the laws affecting women and children. Their work in these and other philanthropic and humanitarian lines has been beneficent.

Women's Rights. The movement in the United States is now an old one to give women their rightful position as citizens, with the widest opportunities in securing a high education, a share in all occupations and industries in which they may care to participate, emancipation from undue legal restraints and hindrances, freedom to enter the medical and other professions and the right of the suffrage (*q. v.*) and political representation. The cause of women, in seeking these rights and privileges, has from an early day been strenuously advocated by such notable women in England as Mary Wollstonecraft Godwin, in America by Lucy Stone, Lucretia Mott, Elizabeth Cady Stanton, Lydia Maria Child, Julia Ward Howe, Susan B. Anthony, Mary Putnam-Jacobi and others. (See articles under titles above.) Abroad, kindred movements among the sex have been organized, with the result that many gains have been made for which women have sedulously sought. Many notable representatives of the male sex have also been in sympathy with women in seeking for and obtaining their rights, particularly in England since the publication of John Stuart Mill's essay on *The Subjection of Women;* while in this country much has been achieved by men's aid, especially since the era of Emerson, Theodore Parker, Henry Ward Beecher, W. H. Channing, Wendell Phillips, Bronson Olcott, W. Lloyd Garrison and Thomas W. Higginson. (See articles under titles above.) The removal of disabilities and the enfranchisement of women have also been much aided at different periods in this country by woman's rights conventions, which date from as early as 1848, the year when organized agitation began at Seneca Falls and Rochester, N. Y., at Salem, Akron, Massillon and Ravenna, O., and at Worcester, Mass. These gatherings were followed about 20 years later by the formation of two national organizations in favor of woman suffrage, which were subsequently (1890) united in the National American Woman Suffrage Association. These and other efforts had wide-reaching effect at home and abroad in extending the suffrage to women, in the modification of property laws and in opening many professions freely to the sex. In Great Britain women can vote now for all offices, save for that of a member of Parliament. In Australia and New Zealand they have the full suffrage. In Canada, in parts of India and in Cape Colony they may vote on various terms for municipal and school offices. In the United States women possess the suffrage at all elections in Colorado, Utah, Idaho and Wyoming; in Kansas they have school and municipal suffrage; in 18 other states women possess the school suffrage; while in New York an enactment in 1901 secured the sex the right to vote in raising money by tax or assessment where they are on the assessment roll and are the owners of property in their own right. Louisiana, moreover, gives women-taxpayers the suffrage upon all questions submitted to the taxpayers; and in Montana and Iowa women may vote upon the issuance of municipal bonds. In several states, on the other hand, antisuffrage associations have been organized, with the view to protesting against women's voting. See CITIZENSHIP.

Wom'bat, a marsupial or pouched animal of Australia. The body is a little more than two feet long, covered with dark-brown hair, and the animal has somewhat the appearance of a small bear. The tail is rudimentary, and the legs are short and stout. The toes end in sharp, curved claws which are of service to the animal in burrowing. These animals are active at night, and feed largely on roots. They are easily caught alive, but in captivity show no affection for their keepers, caring only for food given them. Their flesh is said to resemble pork in flavor and is often eaten.

Wood, Leon'ard, major-general in the United States army, was born at Winchester, N. H., Oct. 9, 1860, and graduated in medicine at Harvard Medical School (1884). In 1886 he was appointed first lieutenant and assistant surgeon in the United States army, and reached the rank of captain and surgeon in 1891. In 1886 he served in Arizona and New Mexico in General Miles' campaign against the Apaches under Geronimo and Natchez, and received a medal of honor for this duty. In May, 1898, on the outbreak of the Spanish-American War, he recruited the 1st regiment of United States volunteer cavalry ("Rough Riders"), and took part in the

fight at Las Guasimas and in the battle at San Juan near Santiago de Cuba, and was given the rank of brigadier-general for gallant service in Cuba. In July, 1898, he succeeded General Brooke as governor-general of Cuba, where he greatly aided in the orderly government and the improved sanitary condition of the island. He remained in that office till the withdrawal of the United States in May of 1902. In 1903 he was placed in command of the army in the Philippines. In 1908 he was given command of the department of the east, with headquarters at New York City.

Wood or Methyl Alcohol, a colorless, spirituous liquid, with a strong aromatic odor, the product of the distillation of wood. It is used in the manufacture of dyes, as a solvent for varnishes and as a methylated spirit after it has been mixed with ethyl alcohol. See ALCOHOL.

Wood'bine', a common name for the Virginia creeper or American ivy, *Ampelopsis quinquefolia*. The name was originally applied in Europe to a species of honey-suckle (*Lonicera*). See IVY and VIRGINIA CREEPER.

Wood-Carv'ing, one of the oldest branches of art, was much practiced among the Egyptians, Greeks and Romans. A life-size statue of a man carved out of a solid block of sycamore, dating probably from 4000 B. C., now in Bulaq Museum, is a fine specimen of Egyptian wood-carving. Egyptian carvings have been preserved in the tombs, but the Greek and Roman carvings have nearly all perished and are known to us only by the descriptions of early writers. It was much used in the decoration of churches in the middle ages, and reached its height in the 15th century, when every church had its carved oak-screen and stalls. The roof of Westminster Hall, made in the early part of the 15th century, is one of the finest examples of the open timber-roof, which admitted of fine decoration. Skill in wood-carving still lingers in Nuremberg and Switzerland. The Moslem wood-carvers of Persia, Syria and Spain produced beautiful work, seen in the mosques and private houses of Damascus, Cairo and other oriental cities. The wood-carving of China and Japan is the finest in the world.

Wood'chuck' or **Ground-Hog,** a burrowing rodent of eastern North America, belonging to the family of ground-squirrels. It is a true marmot, related to the prairie-dog. It has a heavy body, short legs, flat head and beady eyes. The color varies from brownish-gray to blackish. It burrows in swamp-lot and wood-pasture, and feeds on clover and grass. In summer it stores up enough fat to keep it through the winter; retiring early in November, it sleeps soundly for months, curled up with nose under paw, that the warm breath may not be wasted. On February second, so tradition says, the animal comes forth to take a look around; if the sun is shining and it can see its shadow, it retires to its burrow for six more weeks of sleep. This is by some folk considered a prediction of a late, cold spring. See MARMOT.

Wood'cock', a famous game-bird belonging to the snipe family and found in northern parts both of the Old and the New World. The American woodcock is about 11 inches long, variegated in black, brown, gray and rusty colors. The bill is very long and flexible at the end, It is thrust into the soft ground in search of earth-worms, and the presence of woodcocks

WOODCOCK

can often be detected by a cluster of these holes. The European bird is larger. It is a winter resident in England, breeding in summer in the north of Scotland.

Wood-Engrav'ing is copying pictures from blocks of wood, and differs from plate or steel engraving in having the picture raised on the surface of the wood, instead of being sunk, as it is in the metal. The picture is printed from the prepared block, as the letters are from type, the block being made the height of the type. The wood must be hard and fine-grained, box-wood being the best. The block of wood is covered with a white coating, on which the artist draws the picture with lead-pencil, pen or brush. The engraver then cuts away all of the wood around the drawn lines, leaving them raised or in relief. For large pictures several blocks are fastened together for the drawing, and then given to different engravers, so that a large picture can be produced very quickly. Wood-engraving is the earliest and simplest form of engraving. The Chinese claim to have printed from wooden blocks 1,000 years before Christ, and it is probable that the art was brought from China to Europe. A wood-cut of St. Christopher, dated 1423, is one of the oldest specimens of engraving. It was used largely in Europe in the 15th century

WOODCOCK

for two very opposite purposes: the engraving of playing-cards and the illustration of books of devotion. A book of 40 leaves, with a picture and a text of Scripture on each page, is one of the earliest illustrated books known, dating back to the early part of the 15th century. Dürer made great advances in the art in the beginning of the 16th century, and Bewick, who in 1790 published his *British Quadrupeds* and in 1804 *British Birds*, illustrated by himself, showed the possibilities of the art and made it one of the most important of the arts. Its use became general in books, magazines and newspapers, but has been superseded by the various forms of photographic reproduction.

Wood-Pewee. See PEWEE, WOOD.

Wood'peck'er, the name for any member of the family *Picidæ*. This includes birds with stout bills with which they peck wood to obtain insects. Their long tongue is barbed at the end and capable of being greatly protruded. It is in every way adapted for piercing and securing insect larvæ. These birds are of great service to the farmer. Professor Beal declares that they are the "only agents which can successfully cope with the insects of forest and partly of fruit-trees, and for this reason if for no other they should be protected in every possible way." As a family they are black and white, stiff quills and pointed tails helping them to brace against tree-trunks. Though not songsters, they have loud calls and communicate by drumming. They nest in holes in trees, sometimes in telegraph poles.

HAIRY WOODPECKER

The woodpecker is hard at work—
A carpenter is he—
And you may hear him hammering
His nest high up a tree.

There are about 350 species found in all parts of the world, except the Australian region and Madagascar. Nearly half of the entire number occur in the New World, and about 25 species are found in North America. Their colors generally are bright, and the males usually have some red on the head. Among the species of the United States the flicker or golden-winged woodpecker is one of the best known. It feeds mainly on ants, and therefore is frequently seen on the ground. The other woodpeckers almost always are seen on trees. The red-headed woodpecker is abundant in the United States east of the Rocky Mountains. The downy and hairy woodpeckers are smaller birds, both being common. The ivory-billed woodpecker, with a length of 21 inches, is the most magnificent of North American woodpeckers. It is black, with white on the shoulders and wings and, in the males, a scarlet crest. This bird is found in the south and formerly ranged as far north as southern Illinois. The pileated woodpecker also is one of the giants of the family; it has a blackish-brown body and a scarlet head and crest. It is very wild, rare, save in deep forest far from haunt of man. The yellow-bellied woodpecker is the one real sap-sucker. Consult Eckstrom's *The Woodpeckers*. See FLICKER and SAPSUCKER.

Wood's Holl, a town in Falmouth Township, Barnstable County, Mass., on Cape Cod, noteworthy as a center for zoölogical research. Here is the Marine Biological Laboratory (C. O. Whitman, director), which is the most important seaside laboratory in America. The laboratories of the United States Fish Commission are also here.

Wood'stock, Can., in Oxford County, Ontario. It has excellent railway accommodation by the Canadian Pacific and the Grand Trunk and electric railway communication with adjacent towns. It is the center of a rich dairying country. Its furniture, wagon and piano factories do a large epxort business. It owns its own electric plant. The province maintains an epileptic hospital here.

Wool, one of the most important of all animal substances, ranks next to cotton in its use in the manufacture of clothing. It is a sort of hair, growing on sheep and on goats. The fiber differs from a hair in being crinkly or wavy and in having very minute scales, both of which properties fit it for its uses. The wavy twist keeps it from unwinding when made into yarn, and the scales make the threads catch each other, a process known as felting. Wool varies in quality with different species of sheep and also with the food, shelter and climate. The Saxon wool has the most of the felting property, and the wool of the Angora goat, called mohair, is the whitest, while that of the Kashmir goat is very soft and rich though short. The merino sheep furnishes one of the best varieties of wool, a single fleece usually weighing about four or five pounds. In the manufacture of woolen goods the wool is sorted into different grades, washed, scoured and dried. It is then dyed, if to be dyed in the wool, and carded or made into threads, ready for weaving. After weaving, the cloth is scoured to remove the oil and dust, dyed, if dyed in the piece, and dried on stretchers. It is then fulled, a process that shrinks the cloth and makes it more compact. Teasling, a process to raise the threads, and shearing, which cuts them the right length to form the nap, follow, shearing often being repeated several times. The boiling of the

cloth, which prevents spotting and gives a luster, brushing, pressing and folding finish the work. Broadcloths, cassimeres and beavers are strictly woolen goods, while merinoes, bombazines, delaines etc. are worsted goods, named from the town of Worsted, England, in which the processes of manufacture are somewhat different, the wool being combed, which prevents its felting as closely, and also differently spun. The introduction of machinery and steam-power revolutionized the manufacture of woolen goods. A woman could card one pound of wool a day by hand, spin two skeins of yarn, and weave two or three yards of cloth. Now, by the use of machinery, one worker can card 150 pounds of wool, spin 500 pounds and weave from 35 to 50 yards of cloth in a day. The amount of wool produced throughout the world one year was estimated at 2,643,533,794 pounds, nearly half of which came from Australasia, South America and South Africa. Australasia then produced 400,000,000 pounds; Argentina 370,000,000; Russia 361,100,000; the United States 291,783,032; Great Britain and Ireland 133,124,762; Spain 102,600,000; and South Africa 100,000,000. Great Britain has been the largest producer of woolen goods, but the manufacture is growing rapidly in the United States both in extent and in the quality of the goods.

Wool'en Manufacture. With the introduction of power-machinery and the factory-system a great impetus has been given to the manufacture of woolens as well as worsteds in this and other countries; while in recent years there has also been a large increase in the wool-crop and other raw material, raised not only on the North American continent but in other continents and countries, as Australia, South Africa and South America. As the material of which articles of clothing are made, the use of wool dates from early historic times. It is known to have entered into fabrics worn by the ancient Jews as well as by the Greeks and Romans. To-day woolen manufacture is an extensive industry in this and European nations. Early in the 18th century it found seat in Yorkshire, England, where carding, knitting, spinning, weaving and the various processes of cloth-finishing were actively and profitably engaged in. In the production of woolen goods in the United States we have the advantage not only of possessing, annually, large crops of wool besides extensive importations from abroad (the total available United States wool-product, domestic and foreign, amounted in 1905 to about 500 millions pounds' weight, the domestic production in 1906–7 being 298,715,130 pounds), but of having well-nigh numberless looms, with improved and often ingeniously devised machinery for the now vast local production and the utilizing of what is termed waste.

Woolsey (*wo͝ol'sĭ*), **Theodore Dwight,** an American scholar, was born at New York City on Oct. 31, 1801. He studied at Yale, at Princeton and for three years in Germany. He became professor of Greek at Yale College in 1830, and from 1846 to 1871 was president. He was an authority on questions of international law, on which he published a volume. He also edited in Greek a number of Greek plays, and wrote several religious works. The American company of revisers of the New Testament selected him as their president. He died at New Haven, Conn., July 1, 1889.

T. D. WOOLSEY

Woolwich (*wo͝ol'ĭch* or *ĭj*), a town in Kent, England, on Thames River, about nine miles east of London. It is the seat of the principal arsenal of Great Britain, and has the government's factories for producing war-material of all sorts, except gunpowder. The dockyards have existed since 1515, and some of the largest ships of the English navy have been built here. The royal artillery barracks and the Royal Military Academy are also at Woolwich. Population 117,175.

Woon'sock'et, R. I., a city on Blackstone River, 16 miles northwest of Providence. Woonsocket Hill, 580 feet high, the highest point in Rhode Island, is next to the town. It has good schools and a free library, but principally is a manufacturing town, especially of cotton, woolen and rubber goods; it also has a large wringing-machine factory, and ranks as the third manufacturing city of Rhode Island. Population 32,196.

Woos'ter, O., a city, county-seat of Wayne County, 80 miles northeast of Columbus. It is a well-built town, standing on high ground, in a rich farming region. It has factories of agricultural implements, strawboard, whips, organs, furniture, flour, doors, sash and blinds, boilers and engines. Wooster University, founded by Presbyterians in 1866, has three departments, including its medical school at Cleveland, with 35 instructors and 613 students. Other educational institutions are Ohio Agricultural Experiment Station, a high school, elementary school and two libraries. Population 6,063.

Wooster, David, an American general, was born at Stratford, Conn., March 2, 1710. He was in the naval service in command of a vessel to protect the coast in the war between England and Spain, and had com-

mand of a war vessel on the expedition to Louisburg. He was in active service during the French and Indian War, and in the Revolutionary War had command in Canada after the death of Montgomery. When the British invaded Connecticut in 1777, Wooster attacked them at Danbury and was mortally wounded on April 27, and died on May 2, 1777. Wooster, O., was named for him. A monument to him was built by Connecticut.

Worcester (*wŏŏs'tĕr*), a city of England, is on Severn River, about 26 miles from Birmingham. It is an old town, smelting-works in the neighborhood being thought to date back to the time of the Romans. The cathedral, one of the noted ones of England, dates from 1084. It was much injured in the Civil War, but has been restored at great cost. Of the industries the most important are glove-making and the manufacture of porcelain, royal Worcester ware being celebrated for fine designs and beautiful execution. Other manufactures are those of leather, horse-hair weaving, vinegar, wine and engines. Population 46,624.

Worcester, Mass., one of the county-seats of Worcester County, 40 miles southwest of Boston. It ranks next to Boston in population and is a beautiful city, with wide, shaded streets, public parks and fine buildings. The city expends the sum of $646,262 on its public schools, which have a force of 628 day-teachers and 117 night-teachers and an enrollment of 26,360 pupils. Among the higher educational institutions are Clark University, founded in 1888, for strictly graduate work; Clark College, founded in 1902, its trustees being those of Clark University; Worcester Academy; the Free Institute of Industrial Science; the College of the Holy Cross (R. C.); and Polytechnic Institute. The public library; the American Antiquarian Society, with a fine library; the state insane asylum, one of the finest buildings in the country; and the soldiers' monument by Rogers are other noticeable features. The city is extensively engaged in manufactures, as boots and shoes, machinery and machinists' tools, stoneware, jewelry, carpets, machine-needles, awls, wirework, cotton-thread, blankets, felt, water-meters, horse-collars and nails. Worcester was settled in 1713. Population 139,000.

Worcester, Dean Conant, assistant-professor of zoölogy in the University of Michigan and member of the Philippines Commission of 1900, was born at Thetford, Vt., Oct. 1, 1866, and graduated from the University of Michigan in 1889. In 1887 and in 1890 he was a member of the Steere and of the Menage Scientific Expedition to the Philippines, in both of which he studied their fauna and other scientific features of the islands, as also the existing conditions of the people. In 1900 he was appointed a member of the United States Philippines Commission, and wrote *The Philippines and Their People*. In 1893 he was named instructor, and in 1895 assistant-professor of zoölogy and curator of the zoölogical museum at the University of Michigan.

Worcester, Joseph Emerson, an American lexicographer, was born at Bedford, N. H., Aug. 24, 1784, and died at Cambridge, Mass., Oct. 27, 1865. In 1811 he graduated at Yale, and in his early career wrote several geographical and historical textbooks, together with one or two popular dictionaries. His chief work in lexicography, however, was the quarto *Dictionary of the English Language*, which first appeared in 1860 and met with much success.

Word'en, John Lorimer, American naval officer, was born at Ossining, N. Y., on March 12, 1818. In 1835 he entered the navy as a midshipman and eleven years later gained a lieutenancy. Early in 1861, after bearing dispatches to Fort Pickens, he was captured by Confederate troops. Towards the close of the year he was exchanged, and subsequently took part in superintending the construction of *The Monitor* (*q.v.*). When that famous ironclad was completed, Worden was given command. At Hampton Roads, on March 9, 1862, he gave battle to the Confederate ram *Merrimac* (or *Virginia*), then endeavoring to destroy northern warships. In the historic encounter between the two vessels neither was seriously injured, though a hot cannonade was maintained for two hours and over, in which Worden was temporarily blinded by the explosion of a shell on the pilot-house of *The Monitor*. Receiving the thanks of Congress for his service on the occasion, the captain also obtained a step in rank, while he was transferred to the command of *The Montauk*. On the latter ironclad Commander Worden destroyed the Confederate privateer *Nashville*, which had taken shelter under the guns of Fort McAllister, and later took part in the bombardment of Charleston (April 7, 1863). He subsequently was on special duty at New York City, and, as commodore, was head of the Naval Academy from 1870 to 1874. In 1872 he was commissioned rear-admiral, and in 1886, at his own request, he was retired. He died at Washington, D. C., on Oct. 18, 1897.

Words'worth, William, an English poet, was born at Cockermouth, Cumberland, April 7, 1770. He studied at Cambridge, and traveled in France, where he sympathized strongly with the Revolution, but fortunately was compelled by his friends to return home in October of 1792 before his Girondist friends were sent to the guillotine. His first publications, in 1793, were two poems: *An Evening Walk* and *Descriptive Sketches*, which made little impression upon the public, but won the

recognition of Coleridge and the friendship of Calvert, who at his death in 1794 bequeathed $4,500 to the poet, that he might carry out his desire to devote himself to poetry. He settled (1797) with Dorothy, his sister and lifelong companion, at Alfoxden in Somerset, to be near Coleridge. *Lyrical Ballads* was the joint production of the two poets, but brought Wordsworth no nearer to public recognition. Sure of himself, he continued his work, publishing several volumes that were the laughing-stock of some critics; the works of Southey and Coleridge, forming with Wordsworth the Lake School, as it was called, coming in for their share of ridicule. Wordsworth's home was now (1813-50) at Rydal Mount, in the Lake District of England. A claim of the family against Lord Lonsdale was paid, and a county-office with a small salary was secured for the poet, so that he was able to marry and give himself wholly to his literary work. Gradually a select circle of admirers, Leigh Hunt, De Quincey, Wilson and others, made the poet appreciated, and when his *Excursion* appeared (1814), his genius was acknowledged. From that time it grew, until he ranked as the first poet of his day. He received a pension of $1,500 in 1842, and in 1843 became poet-laureate. *The Excursion* and *The White Doe of Rylstone* are his only long poems. His shorter pieces, as *Intimations of Immortality*, *The Skylark* and *The Daisy*, with his sonnets, are the most popular poems. Some of his early poems, as *The Idiot Boy* and *Alice Fell*, still provoke a smile and in some degree justify the ridicule of critics. Wordsworth died on April 23, 1850. He was a prophet of nature and a revealer of the grandeur of simple human nature, and he stands fourth or fifth among the great poets of England. Consult Dowden's edition (1892) of his poems or Knight's (1896), his prose also having been edited by Knight. Myers' *Wordsworth* in The English Men of Letters Series is the best life for the student. The essays of Matthew Arnold, Stopford Brooke, Russell Lowell and Principal Shairp are great helps to understanding Wordsworth. So are *Studies in Wordsworth* by Hudson.

World's Fairs. See EXPOSITIONS.

Worms (*vōrms*), a town in Hesse-Darmstadt, on the Rhine. It is one of the oldest cities in Germany and is the scene of the *Nibelungenlied*. Held by the Romans, destroyed by Attila, rebuilt by Clovis, the residence often of Charlemagne and his successors, it was made a free imperial city by Emperor Henry V. Many German *diets* (national assemblies) were held here, the most famous being the one when Luther defended his work as a reformer before Charles V. During the middle ages it was a large city with extensive trade, but was almost destroyed by the French in 1689. Among its ancient buildings is the cathedral founded in the 8th century. Tobacco, leather and wine are the principal manufactures. Population 43,841.

Worms. See VERMES.

Worth of Foreign Coins in American Money. (It is impossible to obtain absolute accuracy. It also should be remembered that the constant fall in the price of silver lessens the value of silver coins. The values are approximate).

NAME	METAL	COUNTRY	VALUE
Anna	[Money of account]	India	2¢
Argenteus	Silver	Rome (ancient)	25½¢
Argentine	Gold	Argentine Republic	$4.85
As	Copper	Rome (ancient)	1c to 12½¢
Aureus	Gold	Rome (ancient)	$4.50
Bolivar	Silver	Venezuela	19½¢
Boliviano	Silver	Bolivia	97¢
Cash	Copper	China	1/10¢
Centavo	Copper and nickel	Mexico	1¢
Centesimo	[Money of account]	Argentina	1¢
Centesimo	Copper	Italy	1/5¢
Centesimo	[Money of account]	Spain	1/5¢
Centime	Copper	France	1/5¢
Condor	Gold	Chile	$4.50
Condor	Gold	Ecuador	$4.87
Conto	[Money of account]	Portugal...$1,078...and Brazil	$546.00
Crore	[Money of account]	India	$320,000,000
Crown	Silver	Austria	19½¢
Crown	Silver	England	$1.21
Crown	Gold	Portugal	$10.78
Cuarto	Copper	Spain	3/4¢
Daric	Gold	Persia (ancient)	$5.52
Decima	Copper	Spain	5¢
Decime	Copper	France	2¢
Decimo	Silver	Chile	9½¢
Decimo	Silver	Colombia	9½¢
Decimo	Silver	Spain	9¢
Denarius	Silver or copper	Rome (ancient)	17¢
Dinar	Silver or copper	Servia	19½¢
Dinero	Silver or copper	Peru	9 7/10¢
Drachma	Silver	Greece	19½¢
Drachma	Silver	Greece (ancient)	17¢ to 9¢
Dubbeltje	Copper	Holland	4¢
Ducat	Gold	Austria	$2.26
Eikosadrachm	Gold	Greece	$3.80
Eikosipentarion	Silver	Greece	05¢

Name	Metal	Country	Value
Florin	Silver	Austria and England	48½¢
Florin (=guilder)	Silver	Bavaria and Holland	32¢
Franc	Silver	Belgium, France, Switzerland	19½¢
Groat	Silver	England	8¢
Guilder (=florin)	Silver	Holland	32¢
Guinea	[Money of account]	England	$5.09¼
Gulden (=florin)	Silver	Austria	48½¢
Heller	Copper	Austria	½¢
Kopek	Copper	Russia	½¢
Kran	Silver	Persia	19½¢
Kreutzer	Copper	Austria	½¢
Krone	Gold	Austria	$6.64½
Krone	Silver	Austria	24½¢
Krone	Gold	Germany	$2.38
Krone	Silver	Denmark	25¢
Lac	[Money of account]	India	$320,000
Lei	Silver	Rumania	19½¢
Lepton	Copper	Greece	⅙¢
Lepton	Copper	Hebrew (ancient)	1/10¢
Libra	Gold	Peru	$4.87
Lira	Silver	Italy	19½
Lira	Gold	Turkey	$4.32
Livre (=franc)	Silver	France	19½¢
Mark	Silver	Germany	23⅞¢
Medjidie	Gold	Turkey	$4.32
Medjidie	Silver	Turkey	88¢
Milreis	Gold	Portugal	$1.06
Milreis	Silver	Brazil	53¢
Mina	Gold	Greece (ancient)	$19.70
Napoleon (not current)	Gold	France	$3.86
Onlik	Silver	Turkey	40¢
Penny	Copper	England	2¢
Pentarion	Silver	Greece	10¢
Peseta	Silver	Peru and Spain	19½¢
Peso	Silver	Spanish-speaking America	97¢
Pfennig	Copper	Germany	¼¢
Piaster	Silver	Rumania	19½¢
Piaster (=peso)	Silver	Spain	97¢
Piaster	Silver	Turkey	4¢
Piataltinik	Silver	Russia	10¢
Pice	Copper	India	¾¢
Pie	Copper	India	¼¢
Piece-of-Eight	[Money of account]	Spain	40¢
Pistareen (=peseta)	Silver	Spain	19½¢
Polu	Gold	Russia	$7.50
Poltina	Silver	Russia	38¢
Pound (=sovereign)	Gold	England	$4.84 to $4.87
Pound	Gold	Egypt	$4.94¼
Purse	[Money of account]	Turkey	$21.73
Quinarius	Silver	Rome (ancient)	8¢
Real	Silver	Spain	5¢
Rei	[Money of account]	Portugal and Brazil	1/20¢ to ½¢
Rap	[Base coin]	Ireland	½¢
Rin	Copper	Japan	1/10¢
Rix-dollar	Silver	Denmark	54¢
Ruble	Silver	Russia	49¢
Rupee	Silver	India	32¢
Scudo	Silver	Italy	97¢
Sen	Copper	Japan	1¢
Sesterce	Silver	Rome (ancient)	4½¢
Sestertium	[Money of account]	Rome (ancient)	$42.94
Shekel	Silver	Hebrew	60¢
Shilling	Silver	England	24¢
Skilling	Copper	Norway	1¢
Sol	Gold	Peru	48¢
Sol or sou (=centime)	Copper	France	1¢
Soldo (=centesimo)	Copper	Italy	1¢
Sovereign (=pound)	Gold	England	about $4.85
Stater	Gold	Greece (ancient)	$4; Persia (ancient) $5.35
Stiver	Silver	Holland	2¢
Sucre	Silver	Ecuador	97¢
Tael	[Money of account]	China	79¢
Talari	Silver	Abyssinia	48¢
Talent	Gold	Assyrian (ancient)	$1,550 to $2,000
Talent	Gold	Attic (ancient)	$1,200
Talent	Gold	Babylonian (ancient)	$1,550 to $2,000
Talent	Gold	Hebrew (ancient)	$1,550 to $2,000
Talent	Gold	Roman (ancient)	$500
Taler	Silver	Germany	69¢
Tallari	Silver	Egypt	$1.00
Tical	Silver	Siam	48½¢
Tical	Gold	Siam	$5.00
Triens	Gold	Rome (ancient)	$1.70⅝
Triens	Copper	Rome (ancient)	⅓¢ to 4¢
Venezolana (or sequin)	Silver	Venezuela	97¢
Victoriatus	Silver	Rome (ancient)	12⅛¢
Vintem	Copper	Portugal	2¢
Yen	Silver	Japan	48½¢

Wren, a family (*Troglodytidæ*) of passerine birds. They are sprightly little birds, always in motion. About a half-dozen species are found in the eastern United States. The house-wren nests about yards in any suitable hole or cavity and shows a liking for a bird-box, if it can find one unoccupied. It is a pert, bobbing bird about five inches long, of a brown color above, marked with black and gray, and grayish and rusty below. The winter-wren is smaller, being only four inches long, but of similar appearance to the house-wren. In summer it nests north of New England, but is a common winter resident in the eastern states. It is a fine singer. The long-billed marsh-wren is abundant in reedy swamps, making a big, globular nest with a little hole on one side, all suspended from rushes. The Carolina wren is a remarkable singer. It is a larger bird, reaching a length of six inches; its color is reddish brown above and pale buff below. It ranges through the southern states north to Pennsylvania. The European bird is a small, lively bird, nesting in gardens and hedges, and is a great favorite.

Wren, Sir **Chris'topher,** an English architect, was born at East Knoyle, Wiltshire, Oct. 20, 1631. He studied at Oxford, where he invented mathematical instruments. He also, while residing at Oxford as a fellow, became a member of a society for studying and experimenting in natural philosophy. Evelyn in his *Diary* speaks of Wren at this time as "that miracle of a youth." He made improvements on the newly invented barometer and a globe of the moon, which he finished by order of King Charles II at the request of his scientific friends, who also asked the king to command Wren to continue "drawing the shapes of little animals as they appear in the microscope." He was professor of anatomy at Oxford and at London, and with others formed the Royal Society. He had already made plans for the restoration of St. Paul's Cathedral in London, when it was destroyed by the fire of 1666, but in 1675 the new building was begun under his direction, and in 1710 the last stone was laid by his son. Other buildings planned by Wren are the Royal Exchange, Temple Bar, the customhouse and fifty churches in London; Gateway Tower and Christ Church, Oxford; Pembroke College, Cambridge; the Royal Observatory at Greenwich; Buckingham House; and the towers of the western front of Westminster Abbey. He died on Feb. 25, 1723, and was buried at St. Paul's. His tomb has the inscription: *Si monumentum quæris, circumspice* (If you seek his monument, look around). Steele has introduced him in *The Tatler* in the character of Nestor.

Wres'tling, one of the favorite forms of athletic exercise and feats of skill and strength in Greece in early times and a special attraction in contests at the Olympian and Isthmian games. In these early encounters grace of movement on the part of the wrestlers was in some degree as essential to success as was the throwing of an opponent to the ground. From Greece wrestling-matches passed to Italy, and in later times they have become common in England and in this country; while they are a notable feature (known as *jiu-jitsu*) in athletic contests in Japan. The Greco-Roman manner of wrestling has long been the rule in France, as it is in England and here; though tripping, commonly engaged in by modern wrestlers, was not permitted in ancient wrestling encounters. A fall is constituted by both shoulders and one hip or by two hips and one shoulder touching the ground. In the rules observed at the English contests in the Cumberland and Westmoreland matches the man who breaks hold, that is, loses his grip on his opponent, is deemed the loser. The Lancashire style, considered the roughest of wrestling contests, permits catching by the legs as well as wrestling on the ground. In French matches tripping is tabooed; while in German ones the contest is chiefly a struggle on the ground.

Wright, Carroll Davidson, American statistician and writer on social science and economics, was born at Dunbarton, N. H., July 25, 1840, and had an academic education. In the Civil War he enlisted in the United States army, and rose to be colonel of the 14th New Hampshire volunteers. In 1872 he became a member of the Massachusetts senate and chief of the Massachusetts Bureau of the Statistics of Labor. During 1885–1902 he was United States Commissioner of Labor, and took part in the labors of the 11th United States census, and in 1895 he became lecturer on social economics in the Catholic University of America. In 1902 he became president of the collegiate department (now Clark College) of Clark University at Worcester, Mass. He has written largely on statistics and on labor, among his published works being *The Factory System of the United States*, *The Relation of Political Economy to the Labor Question*, *Convict Labor*, *Strikes and Lockouts*, *Working Women in Large Cities*, *Railroad Labor*, *Industrial Evolution of the United States*, *Outline of Practical Sociology*, *Marriage and Divorce* and *Annual Reports* (1873-88) *of the Massachusetts Bureau of Statistics*.

Wright, R. Ramsay, was born in Scotland in 1852; educated at the High School and University of Edinburgh; assistant-professor of natural history, Edinburgh, in 1873; professor of natural history in University College, Toronto, 1874; and its vice-president, 1901. He published

Comparative Anatomy of Vertebrata and *Zoölogy for High Schools.*

Writ'ing, the expression of thoughts by characters to make them known to others, is found in many forms. The hieroglyphic or pictorial writing, in which the idea is expressed by a picture, which afterward became a sign, was common in Egypt, Assyria and Mexico. The invention of the alphabet, which is the basis of the modern art of writing, is ascribed to the Phœnicians, who are thought to have taken some of the signs used in the hieroglyphic writing of Egypt and made of them the characters which represent the sounds of the voice as we now find them in alphabets. The Latin letters were introduced into England by the Romans, and what is called Roman-Saxon writing prevailed until the Saxon became general in the time of Alfred. Norman writing came with William the Conqueror, and the Gothic, Old-English and English court-hand followed. The direction of the writing varies in different nations; the Mexican picture-writing begins at the bottom, the Chinese and Japanese write in columns, beginning at the top and going from right to left; and Hebrew is written from right to left. The materials used were various, including papyrus, parchment and paper, and the instruments have also varied from the stylus and quill to the modern pen and typewriter. See CUNEIFORM and PENMANSHIP.

Württemberg (*vĕrt'tĕm-bĕrg*), a kingdom of the German empire, is in the southern part of Germany, separated from Switzerland by Lake Constance. Its greatest length is 139 miles and its width 105, with an area of 7,534 square miles. The Black Forest is on the western border; and the Swabian Alps cross the country for 80 miles, dividing it into the valley of the Danube and the valley of the Neckar, which are the principal rivers. The climate is mild in the Neckar valley, but cold in the mountains. It is an agricultural country, with extensive orchards, gardens and vineyards; and the grains, hay and fruits are the main products. There is but little coal, but extensive peat-beds, fire-clay, iron, salt, gypsum and tourmaline are found. In 1905 the value of the mineral products in the kingdom was 3,237,800 marks. The state railways in 1906 had a total length of 1,219 miles. There are manufactures of linen, woolen, cotton and silk goods. Beer-breweries and brandy-distilleries are numerous, and 215,500,000 bottles of beer have been used in a year in the country — 125 bottles for each person. The government is a hereditary monarchy. In the empire Württemberg has four votes in the *bundesrat* or federal council and 17 representatives in the *reichstag* or congress. Education is compulsory, and there must be at least one school in every commune. Recent official reports show that there is no person in the kingdom over ten years old who cannot read and write. There are 2,396 elementary schools, with 5,422 teachers and 322,110 pupils, and there are 17,969 students in the higher schools; while the educational system is completed by the University of Tübingen (*q. v.*), founded in 1477. The Suevi held the country when the Romans found it, followed by the Alemanni and the Franks. Ulric I, Count of Württemberg, added to the territory during 1246-65. In 1495 the counts became dukes. The country suffered in the Thirty Years' War and was invaded by a French army which took Montbéliard. Württemberg was made a kingdom at the peace of Pressburg, 1805, the first king, Frederick, being succeeded by his son William I, who reigned 50 years, giving his people a liberal constitution in 1819 and many other reforms. Württemberg joined the German empire in 1871. The capital is Stuttgart (population 249,443). Population of Württemberg 2,302,179.

Würzburg (*vürts'bŏŏrg*), a city of Bavaria, is in a beautiful valley on Main River. Among the noticeable buildings are the episcopal palace, one of the most magnificent royal houses in the world, the large Julius Hospital, the cathedral, rebuilt in the 11th century, and the beautiful *Marien Kappelle*, with 14 statues of the 15th century. The university, founded in 1582, has medical and law schools and musical departments, the medical school being connected with the hospital and having a high reputation. There also are gymnasial, agricultural and trade schools and a Roman Catholic seminary. The manufactures are woolen goods, mirrors, leather, tobacco and wines. Population 80,327.

Wu, Ting Fang, Chinese diplomat and statesman, was born near Canton in China in 1842, and educated at St. Paul's College in Hong Kong, where he practiced for a time as a lawyer and acted as interpreter in the law-courts for the provincial government. From 1874 to 1877 he was in England, where he studied law at Lincoln's Inn, London, and was called to the English bar. On his return to China the Peking government became interested in him, and through the influence of Marquis Li he was appointed a member of the latter's official staff, and later took part in effecting the treaty of Shimonoseki, which concluded the Chino-Japanese War. At Peking he served in other official capacities until 1896, when he was appointed minister to the United States. In the latter capacity, while in this country, he unsuccessfully opposed the re-enactment, without modifications, of the Chinese Exclusion Act. In 1902 he returned to China, being summoned to aid in negotiating

commercial treaties with the United States and other nations; and in the following year he was named vice-president of the Board of Commerce newly organized by the Chinese Government at Hong Kong. In 1908 he was again appointed minister to the United States.

Wy'andots', a tribe of American Indians of the Iroquois family, found originally around Lake Huron. They were called Tobacco Indians by the French, because of the large quantity of tobacco raised by them. They were nearly exterminated by the Iroquois, the survivors finally settling in Michigan, mainly around Detroit, where they furnished the English with 600 warriors in the War of 1812. They settled later along Sandusky River in Ohio, but sold their lands to the United States and moved to Kansas.

Wy'andotte Cave, a curious cave in Indiana, four miles from Leavenworth. It is 22 miles long, and the two largest rooms are 245 feet high. In Mammoth Hall is a mound 175 feet high, with three statues, one called Lot's Wife. The dome is 70 feet from the top of the mound. The White-Cloud Room, Beauty's Bower and the Pillared Palace are other points of interest, all beautifully decorated with crystals, thought by many to exceed in beauty those of Mammoth Cave, Ky.

Wyant (*wī'ant*), **Alexander Helwig,** an American artist, was born at Port Washington, O., on Jan. 11, 1836. After trying the saddlery business, he turned to art, went to Europe in 1865, and became a pupil of Hans Gude at Karlsruhe. He painted American landscapes almost exclusively, being particularly successful in views of the Adirondack wilderness, and gained high standing. His characteristics were subtlety of tone, delicacy of workmanship and ability to catch nature's evanescent moods. Among his pictures are *A Pool on the Ausable* (in the Adirondacks) and *An October Day*. He died at New York City in 1892.

Wy'att, Richard John, an English sculptor, was born at London, May 3, 1795. He studied at London and Paris and at Rome in the studio of Canova. His favorite subjects were classical. *Penelope, Ino and Bacchus* and *Eucharis and Cupid* are some of his best-known works, whose delicacy and finish placed him in the front rank of English sculptors and gained the highest medal for sculpture at the great exhibition in 1851, though he had died at Rome, where he resided, May 29, 1850.

Wyatt, Sir **Thomas,** an English poet, was born in Kent in 1503. He studied at Cambridge and held a position at court under Henry VIII and at Anne Boleyn's wedding. He was English ambassador at the court of Charles V, and on his return lived at Allington in retirement. His poems were published with those of Surrey in 1557. With Surrey he shares the honor of introducing the sonnet (*q. v.*) into England, and his love-poems are among the sweetest of the time. He died on Oct. 11, 1542.

Wycliffe (*wĭk'lĭf*) or **Wiclif, John,** an English reformer, was born near Richmond in Yorkshire between 1324 and 1329. He studied at Oxford, was master of Balliol Hall, since Balliol College, and finally (1374) rector of Lutterworth in Leicestershire. His first oposition to the church was shown in contending for the king against the papal claim to certain tribute-money. In 1374, on a visit to Bruges, where he was sent to confer with the papal legate, he seems to have been confirmed by what he saw in his opposition to the pope. His opinions brought him into trouble, as he was summoned in 1378 before a religious body, but a London mob burst into the chapel and stopped the proceedings. The pope issued *bulls* (papal decrees) against him, and he was again summoned to Lambeth, but escaped with an injunction to be careful what he preached. He began translating the Bible, sending copies of parts of it from village to village. He had a large following, the Lollards, as his disciples were called, being found in all ranks of the people. He was again summoned before the church tribunal, his works condemned to be burned, and he himself banished from Oxford to his parish at Lutterworth. He died on Dec. 31, 1384. His bones were taken up in 1428 by order of the Council of Constance (1415), and burned, and the ashes scattered into the river Swift, a branch of the Avon. Besides his Bible, which was the first English version, he wrote a large number of tracts, over 200 being burned in Bohemia. He was the father of English prose, his translation of the Bible making practically the language that was used by Tindale and his successors in their versions. Historically he is called The Morning-Star of the Reformation, for his works made Hus (*q. v.*) of Bohemia a reformer, and the writings of Hus powerfully influenced Luther (*q. v.*). Consult Burrows: *Wiclif's Place in History;* Lechler: *John Wiclif;* Loserth: *Hus and Wiclif;* Sargeant: *John Wyclif;* Stanley Lane Poole: *Wycliffe;* and Trevelyan: *The Age of Wycliffe.*

Wycliffe College, Toronto, Can., was established in 1877 under the name of the Protestant Episcopal Divinity School. In 1890 the college was federated to the University of Toronto. The college was in 1891 transferred to new and commodious quarters. Through representation in the university's senate it secures a share in administration. The greater part of the students take their arts course in the university and in University College. Degrees in divinity are conferred. It has about 50 students (a three-year theological course)

on its roll, and has sent out 150 graduates. The first foreign missionary sent by the Church of England in Canada went from Wycliffe College.

Wyom'ing, a western and central state of the Union, occupies the northwestern portion of the Rocky Mountains in the United States. The state is bounded on the north by Montana, on the east by Nebraska and South Dakota, on the west by Montana, Idaho and Utah and on the south by Utah and Colorado. The capital is Cheyenne (population 13,570). The other chief towns are Laramie (7,480) and Rock Spring (4,363). Population of the state 101,816.

Surface. Wyoming is broken into a number of spurs or ranges, including the Snow and the Shoshone Mountains in the northeast, within which is the famed Yellowstone (*q. v.*) Park, with magnificent canyons and geysers. Southwestward lie Salt River, Teton and Gros Ventre Ranges, Wind River Range, Sweetwater Mountains and Laramie Range; while south and southwest are Medicine Bow Mountains and Quien Hornet Mðuntain; in the northern section of the state are Big Horn Mountains and east of them Bear-Lodge Mountains. Other elevations embrace Rattlesnake Range, the Green Mountains, the Powder River Range, the Bearspaw and Little Belt Mountains, each with its notable peaks, soaring here and there throughout the state from its 4,000 to 7,000 average elevations to a height of from 13,000 to close upon 14,000 feet. The slopes of these elevations are clad with forests, the timbered area being estimated at 12,500 square miles. The area of the state exceeds that of Oregon, being 97,890 square miles, with a length of 275 and an extreme breadth of 365 miles.

Climate and Drainage. With its high average elevation, extensive mountain-ranges and its extremes of temperature in winter and summer and with insufficient rainfall, Wyoming is not well-adapted for agricultural operations. The climate, though dry and bracing, has extremes of temperature ranging from 120° F. in summer to 44° F. *below* zero in winter. In the north the mean average in January is 18°, and in the south it is 25°, with about 67° for both regions in summer. Though thus unsuited in large part for farming, the state nevertheless has extensive pasture-lands available for stock-grazing on the plains, though not a few are arid, with sandy soil, responding indifferently or not at all to irrigation. Ranching perhaps is best suited to the prevailing conditions, though coal-mining, oil-production and lumbering are the chief industries. Wyoming is further handicapped by indifferent railway facilities and by lack of navigable rivers. Its chief streams, except those that have their outlet into the northern fork of Platte River, drain for the most part into rivers lying outside the state, as the Yellowstone in Montana, the Missouri in South Dakota and the Colorado in Utah. In the north the region is drained by the Yellowstone, with its tributaries of Big Horn, Tongue and Powder Rivers; in the south and east central region the drainage is effected by the northern fork of the Platte, with its tributaries of the Laramie, the Sweetwater and the Cheyenne; and in the southwestern section the principal stream is Green River, which drains into the Colorado. The chief lakes are the Yellowstone, lying within the park, and the Jackson, which is traversed by Snake River.

Natural Resources. The mining returns for 1906 give the yield of coal as 6,133,994 short tons, valued at $8,013,528. Of copper the production in 1905 was 1,068 tons; of crude petroleum, 7,000 barrels in 1906, a value of $49,000; the other metals mined included red hematite iron, lead, asbestos, gypsum and building-stone. In 1906 the value of the total production of all minerals was $9,063,849. The production of cereals in 1905, in addition to the hay-crop and the yield from potatoes, was limited to oats (1,817,365 bushels), wheat (747,487 bushels) and Indian corn (58,678 bushels). The farm-stock returns make a large showing of sheep (5,636,711 in 1906); while the yield from the wool-clip was 10,511,920 pounds, the value being exceeded only by that of Montana's clip. Of neat cattle in 1905 there were 755,200; of dairy-cows close upon 21,000; of swine 16,000; and of horses 121,480. In 1900 the total area of improved lands was 792,332 acres.

Commerce and Transportation. Besides private banks Wyoming had 26 national banks in 1905, with an aggregate capital of close upon 1½ millions and individual deposits amounting to over $8,950,000. The state banks (21), with $428,000 of capital, had deposits amounting to $1,410,000. The receipts of the state in 1904 approximated $600,000, while the expenditures were within $100,000 of the total income. The gross debt amounts to $220,000. The railway mileage is 1,290 miles. The Union Pacific traverses the southern part of the state, while the Chicago, Burlington and Quincy traverses its northeast corner. The Chicago and North-Western railroad, entering from the east, taps the center of Wyoming; while a junction is effected with this road from the south by the Colorado and Southern railroad.

Manufactures. Wyoming makes a poor showing as a manufacturing state, the number of industrial establishments in 1905 being under 360, with an aggregate capital amounting only to $2,695,889; 1,834 wage-earners; and total products of the value of

$3,523,260. The principal industries embrace flour and grist mills, printing and publishing establishments and railroad repair-shops.

Education. With a school population sparsely scattered over the state and not over 25,000 in number, there were 18,345 pupils enrolled in the public schools in 1904–5, while the average daily attendance was limited to 12,200, with 728 teachers. There also were 12 high schools, with an enrollment little in excess of 500. Higher education is represented by the University of Wyoming at Laramie, with 27 instructors and 300 students. The institution, besides a normal school department, has schools of agriculture, mining, commerce, mechanical engineering and music. Of penal and charitable institutions the state maintains a hospital at Rock Spring, with an auxiliary branch at Sheridan, an insane asylum at Evanston and a penitentiary at Rawlins.

History and Government. Though Wyoming (a part originally of the Louisiana Purchase of 1803) was by Congressional Act erected into a territory in 1868, the region in early days was visited by hunters and fur-traders; while explorers, as Verandrye in 1743-4, are known to have gone over the district in pioneering expeditions and in search of game and furs even before the middle of the 18th century. Early in the 19th century trappers from Montana are also known to have visited the Yellowstone region and gone as far inland as Laramie Fork of Platte River, where a fort was built in 1834, which in the following year was acquired by the American Fur Co. and later sold to the Federal government. Captain Bonneville and General Frémont, moreover, were among those familiar with the region in the thirties and forties. Settlement, however, was slow. Indeed it did not begin to be made until the passing through of the Mormons on their way to Utah and the subsequent finding of gold in the valley of Sweetwater River, aided by the construction of the Union Pacific. In 1867 Cheyenne began to be settled, in 1868 Wyoming became a territory, and in 1869 Cheyenne became the capital. Before this there had been trouble with the Sioux, who resented the coming of white settlers. Subsequently the Indian difficulties were settled, reservations were assigned to the tribes, and about one and a half million acres were bought from the Shoshones and other natives and thrown open to settlement. Forest-reserves were also set apart in Yellowstone Park and othersections, and a chain of forts was erected by the government for the security of the region and the protection of the incomers and settlers. The population having grown, especially in the south the movement originated to form a constitution and apply for statehood. This occurred in 1889, and on July 10, 1890, Wyoming became a state. Wyoming sends a single member to the lower House of Congress. Its chief executive officers besides the governor include a secretary of state, a treasurer and a superintendent of public instruction. Consult *Resources of Wyoming;* Bancroft's *Nevada, Colorado and Wyoming;* and U. S. Geological and Geographical Survey Reports.

Wyoming Valley is a beautiful valley on Susquehanna River in Luzerne County, Pennsylvania, inclosed by mountains. During the Revolutionary War 400 British troops, with 700 Indian allies, entered the valley, where there was a town of 2,000 inhabitants. Many of the defenders of the place were absent in the Continental army, and only 300 men could be gathered to meet the attack. After a desperate struggle, July 3, 1778, they were driven back to the fort, which surrendered on July 5, when the Indians indiscriminately massacred all who could not escape by flight. Campbell has preserved the story in his poem of *Gertrude of Wyoming.* It is now thought that Brant, the Mohawk chief, according to Campbell one of the chief actors, was not present at the attack. In 1843 a monument was erected on the battlefield. Consult Peck's *Wyoming.*

X

X (*ĕks*), the twenty-fourth letter, is a double consonant or, rather, a superfluous sign for the compound consonants *gz* and *ks*, as in *exist, wax*. *X*, when followed by an accented syllable beginning with a vowel, or when followed by silent *h* and an accented vowel, is *gz*, as in *exalt, exhort*. But in a few exceptions to this rule and in other words *x* is *ks*, as in *exar'chate, excellent*. X at the beginning of words has the sound of *z*, as in *xebec*, and in some compounds keeps the *z* sound, as in *metaxylene*. Final *x* always is *ks*, as in *ax*.

Xanthippe (*zăn-tĭp'pē*), the wife of Socrates (*q. v.*), has the reputation of being an archtermagant, doubtless with some reason. Still it should be remembered that her naturally infirm temper must have been severely tried by the small concern manifested by Socrates in relation to his domestic affairs. Socrates had completely mastered his naturally strong appetites and passions and had acquired a temper of perfect serenity. It is but natural then that historians, on ever so small a basis of fact, should delight to match such a philosopher with a woman of such a temper as Xanthippe is said to have possessed. On the other hand, if we can trust Plato, she seems to have really loved her husband, and at his death he tenderly committed her to the care of his friends. Many stories are told of her to illustrate her peculiar infirmity, but it is impossible to tell how much credit should be given to them. The era of Socrates was 470–399 B. C.

Xavier (*zăv'ĭ-ĕr*), **Saint Francis,** The Apostle of the Indies, one of the first members of the *Societas Jesu* (Jesuits), was born at Navarre, Spain, April 7, 1506. He was educated at Paris, graduating in 1530. Soon afterwards he joined the order formed by Ignatius Loyola, and on Aug. 15, 1534, took vows with five others, devoting themselves to missionary work in Palestine. War prevented them from carrying out this plan. When Loyola was requested to send missionaries to the Portuguese settlements in the Indies, Xavier was selected, and with one associate set out from Lisbon in 1541. He went first to Goa, to Ceylon, to Malacca and then to Japan. He intended next to go to China, but died when only in sight of that empire, Dec. 5, 1552. He was buried at Goa. It is said that during his ten years' apostleship, he planted the faith in 52 different kingdoms, preached the gospel through 9,000 miles of territory, and baptized more than 1,000,000 persons. He was canonized by Pope Gregory XV in 1622.

Xenia (*zē'nĭ-ă*), **O.,** county-seat of Greene County, is a flourishing city, midway between Cincinnati and Columbus, on the Pittsburg, Cincinnati, Chicago and St. Louis Railway. The industrial establishments embrace marble and granite works, manufactories of rope, cordage, twine, shoes, paper-board, sawmills, planing-mills and a handle-factory. Besides its various manufactories and other enterprises it is the seat of the theological seminary of the United Presbyterian church and of the Ohio Soldiers' and Sailors' Orphans' Home. Wilberforce University, an institution for the education of colored youth of both sexes, is located three miles from the city. Population 9,356.

Xe'non. See ARGON.

Xenophon (*zĕn'ô-fŭn*), a Hellenic general, historian and philosopher, was born at Athens in 430 B. C. At an early age he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At 40 he joined the expedition of Cyrus the Younger (*q. v.*) against Artaxerxes Mnemon, king of Persia, and after the battle of Cunaxa and the treacherous murder of the Greek generals played an important part in the Retreat of the Ten Thousand. Soon after his return to Greece he settled in a small town in Elis, where he lived for over 20 years, occupying himself in agriculture and literary pursuits. He is supposed to have died at Corinth in 355 B. C. Xenophon's principal works are *The Anabasis*, a history of the expedition of Cyrus and the Retreat of the Ten Thousand; *The Cyropedia* or education of Cyrus and *Memorabilia*, a series of dialogues intended to refute the charges on which Socrates was condemned to death.

Xerophytes (*zē'rô-fīts*), plants adapted to dry soil and air. The conditions of drouth may be occasional, periodic or permanent, and plants have various ways of meeting them. The plan is to avoid as much exposure as possible and to store what water can be obtained. Prominent among drouth adaptations are underground habits (geophilous plants), rolling or folding of leaves, profile position of leaves (compass-plants), motile leaves which can shift their position (sensitive plants), small leaves etc. Probably the most conspicuous feature of plants

in permanently dry regions is the organization of reservoirs which retain water and dole it out, according to the need. Such plants, therefore, usually are fleshy or succulent. The xerophytic societies are numerous, and among them may be mentioned rock societies, composed of plants living upon exposed rocks, walls etc.; sand societies, including beaches, dunes and sandy fields; shrubby heaths, in which species of the heath family abound; plains, the great dry areas in the interior of continents; cactus deserts of the southwestern states and Mexico; and tropical deserts, where the drouth conditions are extreme and the vegetation scanty.

Xerxes (*zĕrks'ēz*) **I,** king of Persia, was the oldest son of Darius by Atossa, his second wife, and was appointed successor by his father in preference to Artabazanes, his oldest son by his first wife. Darius died in 485 B. C. in the midst of preparations for a third expedition against Greece; and Xerxes, as soon as he had subdued the rebellious Egyptians, gave his whole attention to the completion of his father's plans for the subjugation of the Hellenic states. A bridge of boats a mile in length was built across the Hellespont; and a canal was cut through Mt. Athos, near which the fleet of Mardonius had been wrecked in 492 B. C. In the spring of 480 B. C. the vast army, said to number 2,000,000, began to march toward the Hellespont; according to Herodotus it took this force seven days and nights to march across the bridge. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times or perhaps at any known epoch of history." This immense force moved on without resistance till brought to a stand by Leonidas at Thermopylæ; and, although the Greeks were defeated and slain, it was not without severe fighting and heavy loss on the part of the Persians. When Xerxes arrived at Athens, three months after crossing the Hellespont, he found the city deserted. Meantime the Persian and Greek fleets had taken their positions in the narrow strait between Salamis and the Attic coast, where the great naval battle of Salamis took place, in which the Persians were signally defeated, Xerxes himself fleeing in haste to the Hellespont. The bridge of boats having been destroyed in a storm, he crossed in a vessel, leaving Mardonius with 300,000 men to carry on operations in Greece. Next year that general was defeated by the Greeks in the famous battle of Platæa; and in 478 B. C. the Persians lost their last possession in Europe by the capture of Sestos in the Hellespont. Little more is known of the history of Xerxes, except that he was murdered by Artabanus, who aspired to the throne, and was succeeded by Artaxerxes, his son, in 465 B. C. Herodotus commended him as a man and as a monarch. See GREECE, LEONIDAS, PLATÆA, SALAMIS, THEMISTOCLES and THERMOPYLÆ.

Ximenes (*zĭ-mē'nēz*) **De Cisneros, Francisco,** in Spain commonly called Cisneros, a well-known statesman, archbishop and cardinal, was born at Torrelaguna in Castile in 1436. His great reputation for piety and learning led Queen Isabella to choose him in 1492 for her confessor and three years after to appoint him archbishop of Toledo — a dignity which he refused to accept until he had received an express command from the pope. In 1507 he was promoted to the dignity of cardinal. During the lifetime of Isabella he was the guiding spirit in Spanish affairs; and on her death in 1504 he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, heiress of the crown. When Ferdinand died in 1516, he named Ximenes regent of Spain until the arrival of Charles his grandson; and, although the grandees formed a powerful combination against him, he was able to subdue them by his prompt and efficient measures and compelled them to submit to his authority. Scholars are indebted to him for the famous Complutensian edition (1502–18) of the Bible in several languages. He died at Roa on Nov. 8, 1517.

Ximenes de Quesada (*zĭ-mē'nēz dā kā-sā'dä*), **Gonzalo,** a Spanish explorer, was born in Granada in 1498, and came to America in 1535, when, under the orders of Governor Santa Marta, he took command of an expedition against the Chibcha Indians in New Granada. After enduring great privations and overcoming all obstacles, he conquered the cities of Tuna and Iraca, where he secured a vast quantity of treasure, which he divided among his soldiers. In 1538 Ximenes founded the city of Bogota in Colombia, and soon after sailed for Europe with Frederman from Venezuela and Benalcazar from Quito, in order to refer all matters in dispute between them to the king. Ximenes was at first fined and suspended from his offices by the king, but afterwards was sent to New Granada with the title of marshal. In 1561 he was appointed governor-in-chief, a position which he continued to hold until his death at Mariqueta, Feb. 16, 1579.

X-Ray. See ROENTGEN RAYS.

Xylem (*zī'lĕm*), (in plants), that portion of a vascular bundle which contains the tracheary tissue and commonly is called the wood. The xylem is chiefly concerned in the ascent of sap, and in trees forms all of the trunk except the bark. See VASCULAR BUNDLE.

Y

Y (*wī*), the twenty-fifth letter, sometimes is a voiced consonant, sometimes a semivowel. The consonant is a palatal, as in *beyond*, *year*. The semivowel is closely akin to long *e* and short *i*, as in *happy*. *Y* occurs as a consonant at the beginning of syllables or words, but *y* the vowel at the middle or end. The vowel is a superfluous letter. *Y*ᵉ and *Y*ᵗ are mistakes for *the* and *that*, *Y* resembling an Old English letter for *th*.

Yacht (*yŏt*), a small vessel so constructed as to secure elegance and speed, and exclusively employed for racing and pleasure-sailing. The first authentic record of a sailing club is in 1720, when the Cork Harbor Water Club, now known as the Royal Cork Yacht Club, was established in Ireland. But the boats were small. From this time to the end of the 18th century yachting developed very slowly. Yacht-racing as a pastime scarcely had a beginning at the opening of the 19th century. During that century, however, the progress was such that there are numerous yacht clubs in Europe and the United States, and improvements almost without number have been devised for increasing the speed and efficiency of vessels constructed for yachting purposes. As to the number of yachts now afloat, cruisers as well as racers, the British yacht-fleet, which in 1850 consisted of 500 sailing vessels and three steamers, now numbers over 4,000 yachts Next to Great Britain the United States possess the largest number afloat, amounting to about 1,500. If to the foregoing are added the yachts of other countries, a grand total of 6,000 or 7,000 is reached. While the construction of sailing-vessels has wonderfully progressed since 1850, the building of steam-yachts has gone on still more rapidly. The building of yachts has changed greatly from the simple, unpretending brig, with small tonnage, clumsy build and baggy sails of the early yachts of the Royal Cork Club, to the immense flat sails, larger size and long, narrow shape of the yacht of the present. The effect of these changes was a great increase of speed. Racing yachts are schooners, cutters or yawls. The schooners nearly are always fore-and-aft rigged, *i. e.*, not carrying square topsail yards on the foremast. The cutter differs from the American sloop in carrying a sail, termed the foresail, on a stay from the masthead to the stem, the jib and flying jib being set on a long running-bowsprit. The cutter, in fact, substitutes two head-sails for one used in the sloop. The yawl differs from the cutter in carrying a slightly reduced mast and boom, the latter leaving room for a small aftermast, stepped close astern, on which is set a lugsail sheeted home to the end of a running-boom. In racing the competitors use a large racing-sail, called a spanker, set on a long beam projecting from the foot of the mast at right angles to the vessel. The sail, which is flat and triangular, extends from the topmast head to the deck, on the opposite side to that occupied by the main-boom, though occasionally shifted to the bowsprit end. In 1851 the schooner *America* crossed the Atlantic and won the queen's cup from the *Aurora*. In the half-century following England made 11 vain efforts to win back the cup, the most exciting and hardest-fought race being the contest between the English *Genesta* and the American *Puritan* in 1885. Great interest was roused by the race between the Irish challenger *Shamrock II* and the American defender *Columbia*, winner in 1901 of the cup, which America has now won and held in 12 successive races. In 1903 the American *Reliance* was the winner against *Shamrock III*.

Yak, an ox-like animal found in Tibet and central Asia. It is related both to the bison and the true oxen. In a wild state it is found on the high plateaus of Tibet between the Altai and Himalaya Mountains. It can at once be distinguished by the long hair, which hangs from each side like a curtain, in some cases touching the ground. The hair is longer in the domesticated than in the wild forms. The tail also is very hairy, and the white tips are cut off by the Chinese, who dye them red and use them as tassels. There is a hump over the forelegs, and this is exaggerated by the hairy mane. The yak has been domesticated for centuries in Tibet, and is extensively used as a beast of burden. It feeds on grass, and one peculiarity of its feeding is that it refuses to eat corn. These animals are about the height of a small ox. The cows yield milk, and the skins both of cows and bulls are used for clothing.

Yakutsk (*yȧ-kŏŏtsk'*), the chief town of the government of that name in eastern Siberia. It is situated on the left bank of Lena

River, 5,000 miles from St. Petersburg. The whole industry of the town consists of candle-works; but it is the principal market of eastern Siberia for traffic with the native tribes of Yakuts and Buriats. Population 6,534.

Yale, District of, west of the Kootenays, is rich in minerals and timber and possesses the largest area of agricultural land in southern British Columbia. It includes the rich valleys of Okanagan, Nicola, Similkameen and Kettle Rivers and North and South Thompson and the Boundary, and has been named The Garden of British Columbia. The main line of the Canadian Pacific passes nearly through the center of Yale from east to west, while its Okanagan branch and steamers on the lake give access to the southern portions. New branch-lines are projected and some are in course of construction, which will open a large mining and agricultural area. Cattle-raising on a large scale has been one of the chief industries, but many of the ranges are divided into small parcels which are eagerly bought by fruit-growers and small farmers. This district is rich in minerals and coal, but development has been delayed by lack of facilities for transportation.

Yale, Eli'hu, after whom Yale College (now Yale University) was named, was born at New Haven, Conn., April 5, 1648. When he was ten, his parents returned to England, and he never returned to America. In 1678 he went to the East Indies, where he remained several years and accumulated a large fortune. On his return to England he became governor of the East India Company and a fellow of the Royal Society. His gifts to the new institution in books and money amounted to about $4,000, in consequence of which it was named Yale College. He died at London, July 8, 1721.

Yale U'niver'sity, at New Haven, Conn., is one of the oldest and most famous of educational institutions in the United States. It was founded in 1701 as the Collegiate School of Connecticut, and was at Saybrook until 1716, when it was removed to New Haven. In 1718 the name was changed to Yale College, in recognition of large gifts from Elihu Yale of London. This name was changed by statute to Yale University in 1887. Besides the academical department, still designated as Yale College, it has Sheffield Scientific School, a graduate school, a divinity school, a medical school, a law school, a school of art and a school of music. In all its departments it is thoroughly equipped and amply endowed. Its libraries contain 500,000 volumes. The faculty numbers 390, with an attendance of 3,300 students in 1908.

Yam, the tuberous root of a species of *Dioscorea*, a genus of climbing vines chiefly displayed in the tropics, where they are extensively cultivated for food. The name has also but wrongly been applied to forms of the sweet potato.

Yan'cey, William Lowndes, a highly distinguished southern orator, was born at Ogeechee Falls, Ga., Aug. 10, 1815. After receiving a collegiate education he was admitted to the bar in Abbeville, S. C., but in 1836 moved to Alabama, where he successively edited *The Catawba Democrat* and *The Wetumka Argus*. He was a member of Congress in 1844-47, and in all the events leading to the secession of the southern states was one of the most prominent and perhaps the most eloquent leader of the proslavery party — the extent of his influence in "firing the southern heart" and inducing the effort to secede being hard to overestimate. When war broke out, he was sent (1861) to Europe as the agent of the Confederate government, but failed to secure recognition by any of the European powers. On his return home he became a member of the Confederate congress, and died near Montgomery, Ala., July 28, 1863.

Yang=tse=Kiang (*yăng'tsē-kĭ-ăng'*), the principal river of Asia, the "girdle of China," connecting all its central provinces between Tibet and Koko-Nor and the Pacific. Its entire length through all its numerous windings under various names cannot be less than 3,000 miles. To name the cities on the banks and tributaries of this rival of the Mississippi would be to enumerate a large portion of the cities of the empire. It is navigable by the largest vessels for 900 miles from its mouth and by smaller ones for a much greater distance.

Yan'kee, the popular name for a New Englander in America, and in Europe often applied indiscriminately to the entire population of the United States, perhaps originated as a corruption of the word *English* or of French *Anglais*, as pronounced by the Indians — *Yenghies*, *Yanghies*, *Yankees*. It seems to have been first applied by British soldiers to the New Englanders as a term of reproach during the Revolutionary war. During the Civil War it was applied by the southern people to all the inhabitants of the northern states.

Yankee Doo'dle. This popular air was originally *Nankee Doodle*, and is as old as the time of Cromwell. It was known in New England before the Revolution, and is said to have been played by the English troops in derisive allusion to the then popular name of the New Englanders; and afterward the New Englanders adopted the air.

Yank'ton, So. Dak., county-seat of Yankton County, is beautifully located on the northern bank of Missouri River, near the mouth of the James. It formerly was the capital of Dakota Territory. Three lines of railway enter or pass through the city,

which is also connected by steamer with various points on the Missouri. The state hospital for the insane and Yankton College (Congregational) are located here, as are also flouring-mills, a brewery and large works for the manufacture of fine hydraulic cement. Artesian wells supply the city with pure water. Population 4,189.

Yard, The Impe'rial, is the British standard of length, being the distance between two parallel lines on gold studs (or plugs) driven into a bar of bronze, deposited at the Standard's Office in London and used at a temperature of 62° F.

Yates, Edmund Hodgson, English novelist and dramatic critic, was born at Edinburgh, July 3, 1831, and, after serving for a number of years in one of the departments of the London postoffice, retired in 1872. He successively edited *Our Miscellany*, *Temple Bar* and *The World*, besides writing novels and dramas. His best-known novels are *Broken to Harness*, *Black Sheep* and *Kissing the Rod*. He died at London, May 20, 1894.

Yates, Richard, was born at Warsaw, Ky., Jan. 18, 1818, and after graduating at Illinois College studied law and was admitted to the bar. He served a number of terms in the Illinois legislature, and during the Civil War was governor, a position in which he won an enviable reputation for zeal and patriotism as well as for vigor and efficiency in organizing and equipping troops. So great was his popularity with the people, among whom he was familiarly known as "Dick" Yates, that, as soon as his term as governor expired, he was chosen to a seat in the United States senate, which he filled till March 4, 1871. He died at St. Louis, Nov. 27, 1873.

Yazoo', a river of Mississippi formed by the union of the Tallahatchie and the Yallobusha, runs southwestward in a very serpentine course in a deep, narrow, sluggish channel — its length being about 300 miles — and empties into the Mississippi, ten or 12 miles above Vicksburg. In the winter of 1863-64 General William T. Sherman sailed up the Yazoo with a considerable military force for the purpose of capturing the fortified position of Haines' Bluff from the Confederates, preparatory to an attack on Vicksburg. The expedition was unsuccessful.

Yeast, the common name of species of *Saccharomyces*, a genus of low plants (fungi) probably belonging to the *Ascomycetes*. The yeast-plant is a single, simple cell, which produces new cells by a peculiar budding-process. Usually the cells thus produced cling together in short chains. The most generally known of the 25 described species is *S. cerevisiæ*, the yeast used by brewers and bakers. The use of yeast is due to its great activity in the process of fermentation. When placed in sugar-containing solutions and exposed to a proper temperature, the cells multiply with great rapidity, and in their living cause the sugary solution to "sour." In this "souring" process the gas — carbon dioxide — is given off, and if it is held by some tenacious substance, as dough, it will puff it up, that is, make it "light." The process of adding yeast to dough is simply sowing yeast-plants that they may grow. See Ascomycetes.

YEAST REPRODUCING BY BUDDING

Yed'do. See Tokio.

Yel'low Bird, the name in general use for two different birds of the United States. One of them is the goldfinch, which is one of our most attractive birds. It is about five inches long, and in the summer has a yellow body, with black on the crown and black and white on the wings and tail. It also is a winter resident, but the winter dress is different, being grayish-brown, with a yellowish crown and soiled white below and a yellowish throat. The name is also given to the yellow warbler, which is also locally called the wild canary. See Goldfinch and Warbler.

Yellow Fever (Yellow Jack), an acute specific disease occurring within certain geographical limits; mostly in the West Indies, whence it is carried to climates where the temperature is above 72° F. It is characterized by a fever of short duration, a yellow tint of the skin, gastrointestinal disturbances and hemorrhages into the skin and mucous membranes. The precise nature of its virus is unknown. A severe visitation occurred in the lower Mississippi Valley in 1874, with 5,000 deaths in New Orleans and Memphis. Until the American occupation of Cuba yellow fever was practically never absent from that island. Experiments carried on in Cuba by the medical department of the United States army proved that the disease is communicated from one individual to another only by a single species of mosquito (*Stegomyia Fasciata*). Sanitary scientists predict con-

fidently that the world will soon be rid of this scourge through improvement of hygienic conditions and the avoidance of the mosquito.

Yellow Race, The, often called the Mongolian race, includes that part of mankind which is regarded as most characteristically Asiatic. More specifically, the yellow race includes Chinese, Japanese, Tartars, Cochin-Chinese, Burmese, Tibetans, Samoyeds, Tamuls, Turks, Finns and Hungarians or Magyars. (See articles under titles above.) Some authorities believe that the Malayans and many Polynesians are distinctly Mongolian. The theory that the American Indian is descended from the Mongolian race is not generally accepted. The Celts, too, have certain traits in common with the Mongolians; but there is no proof of an actual racial connection. The characteristics of the yellow race are straight hair, coarse in texture and black in color, more abundant on the head than the face, least abundant on the body, a somewhat square head, small black eyes, narrow eyelids, which turn obliquely upwards at the outer end, small, flattish nose, high and prominent cheek-bones, rather prominent chin and yellowish skin. The yellow race probably is not inferior to the white race in intellect and fortitude; though anthropologists incline to the opinion that physically it is nearest of all races to the child and that it may represent the most primitive extant type of man.

Yellow Sea, an important inlet of the Pacific Ocean, washes the northeastern coast of China and is bounded on the west by the Chinese provinces of Shangtung and Keang-su and on the east by the peninsula of Korea and by Japan. It is more than 600 miles in length and about 400 in average breadth. Its waters are shallow and are gradually becoming still shallower, owing to the deposits of earth borne down into it by Hoang-ho and Yang-tse-Kiang Rivers.

Yellow Springs, O., a village of Greene County, 75 miles from Cincinnati, on the Springfield branch of the Panhandle railroad. It is situated in a fine agricultural region and is chiefly noted as being the seat of Antioch College, a Unitarian institution, of which the distinguished Horace Mann was the first president. Population 1,377.

Yel'lowstone, a river of the United States, rises in a beautiful lake of the same name high up in the Rocky Mountains. Receiving numerous branches from the south, it flows northeasterly through Montana and empties into Missouri River, in North Dakota, in 48° N. and 104° W. It is 800 yards wide at its mouth; 1,000 miles long; and navigable for 700 or 800 miles. The Grand Cañon of the Yellowstone is 3,000 feet deep, and to one looking up from the bottom stars are visible in broad daylight. The grandeur of the cañon is at once heightened and diversified by the upper and lower falls, the latter being one unbroken and symmetrical expanse 350 feet in height. The beautiful lake from which the river issues is about 300 square miles in area, and is between 7,000 and 8,000 feet above the sea.

Yellowstone National Park, a tract 62 miles in length and 51 in breadth, situated mainly in the northwest of Wyoming, which has been withdrawn from settlement by action of the United States government and set apart as a public park. The area of the national reservation is 3,412 square miles, exclusive of the area on the south and east of the park proper, set aside by Congress as a forest-reserve (*q. v.*). Yellowstone Park was created by an act approved in March, 1872, and is under the supervision of the secretary of the interior. Leases were in 1889 granted by the national government to Yellowstone Park Association to erect at certain suitable points hotel accommodation for visitors to the park and to maintain a naphtha launch on Yellowstone Lake, conformable to certain restrictions. The government has also provided that care shall be taken of the remnant of North American fauna and of the ruminants of the western plains and mountains, with such fish as may live in the waterways of the park outside of the geyser region. The park abounds in scenery of unparalleled grandeur. It is a region of hot springs and geysers, mountains and cañons, lakes and waterfalls. Its surface mainly is an undulating plateau, with a mean elevation of 8,000 feet above the sea, upon the surface of which flow the minor streams, while the larger ones have cut cañons for themselves, several of them of great depth. The eastern portion, however, is occupied by a mountain chain known as Absaroka Range, peaks of which rise to heights exceeding 11,000 feet. These mountains, which separate the waters of the Yellowstone from those of the Big Horn, are unsurpassed by any in the United States for grandeur and sublimity of scenery. Another group of mountains, in the shape of a horseshoe, known as Washburne Mountains, occurs in the middle of the park, the highest peak of which has an elevation of 10,000 feet. The Red Mountains are in the southern part, Mt. Sheridan, their culminating peak, being likewise about 10,000 feet in height. The park has an abundant rainfall and its streams are numerous and bold. Within its area are the sources of the Yellowstone and the Madison, which go to make up the Missouri, and of the Snake, one of the tributaries of the Columbia. It also contains many beautiful lakes and ponds. A convenient way of reaching the park from the east is by the Burlington route from

Chicago *via* St. Paul (Minn.) and Bismarck (N. Dak.) to Livingston (Mont.), thence southwest to Cinnabar, and thence by stage through the park. From St. Louis, Kansas City and from Burlington (Ia.) the Burlington route, *via* Omaha, is also available, the entrance being also by way of Livingston (Mont.) and Cinnabar, on the northwestern boundary of Wyoming. From Cinnabar a daily stage sets out for Mammoth Hot Springs, by way of Gardiner, a distance of six miles, where good accommodation for sight-seers is to be had, as well as at convenient points in the five days' staging throughout the park, under a franchise from the United States government. From Mammoth Hot Springs the stage-route embraces the Norris Geyser basin, the Lower Geyser, the Upper Geyser and the Lake Geyser at the western arm of Yellowstone Lake (over which a steamboat now plies), thence on the return route by way of the Grand Cañon and the Falls of the Yellowstone. The roads throughout are good, being maintained by the government.

Yen, the unit of value and account in Japan, its value being 48.5 cents in American money. Japan mints the following coins in gold (besides the silver *yen*): 1, 2, 5, 10 and 20 *yen* pieces — the value of the 10-*yen* piece being $4.85; and of the 20-*yen* piece $9.70 the rough equivalent of our $5 and $10 gold coins.

Yenisei (*yĕn'ê-sā'ê*), one of the largest rivers of Siberia, formed by the junction of the Onlon-Keme and the Bey-Keme, which rise in the mountains on the southern border of the country. It flows northward through the center of Siberia into the Arctic Ocean, forming at its mouth a long estuary. In the earlier part of its course it is interrupted by falls and rapids, but afterwards flows through a great plain or *steppe*, receiving many tributaries, its total length being over 3,000 miles.

Yew, the common name of species of *Taxus*, a genus of conifers, distributed throughout the northern temperate regions. The most noticeable peculiarity of the genus is the development of a fleshy (usually scarlet) cup ("aril") about the naked seed, making the fruit look like an open berry. The common yew of Europe (*T. baccata*), very often cultivated, especially in cemeteries, is a tree of somber aspect. Veneration and superstition have long clung about it. It lives to a great age in the Old World. The American (*T. Canadensis*) is a more or less prostrate form, which is especially abundant northward; a stunted shrub with very tough wood.

Yez'o or **Yes'so,** the most northerly of the four principal islands which compose the empire of Japan. It is known also as Hokkaido. This island is mountainous and has volcanoes; it is rich in fine timber and valuable minerals, especially coal; and the rivers and coasts abound in fish. Area of Yesso or Yezo 36,299 square miles. Population 460,155.

Yokohama (*yō'kō-hä'mä*), a town of Japan on the island of Nippon. In 1854 it was a small fishing-village, but after it supplanted Kanagawa as the treaty-port of Yeddo in 1859 it rapidly increased. Since the recent changes in the policy of the Japanese government great improvements have been made; and broad and cleanly streets have taken the place of the former narrow and dirty thoroughfares. Population 326,035.

Yonge, Charlotte Mary, English novelist, was born at Otterbourne, Hampshire, on Aug. 11, 1823. The novel by which she is best known, although she has published several others, is *The Heir of Redclyffe*. She is said to have devoted large sums accumulated from the sale of her writings to the aid of religious missions in New Zealand. She died on March 24, 1901.

Yon'kers, N. Y., a city of Westchester County, on the Hudson River, immediately north of New York City. It was incorporated as a village in 1855; and in 1872 the town was divided, the northern portion becoming the city of Yonkers and the southern portion becoming Kingsbridge, and in 1874 a part of the city of New York. Yonkers is built on terraces rising from the Hudson 426 feet above tidewater and commanding a view of the Hudson and its Palisades. The buildings of note are the government building, three hospitals, Leake and Watts Orphan Home, the Hebrew Home for the Aged and Infirm and St. Joseph's Training School for Nurses. Yonkers has 30 churches, an admirable system of public and parochial schools, a public high school and, near the city-limits, St. Joseph's Seminary and Mount Saint Vincent Academy. The city also possesses a Carnegie Library, Woman's Institute Library and Hollywood Inn for Workingmen, with its library of 6,000 volumes. Population 61,716.

York, a city of England, situated at the junction of Ouse and Foss Rivers, nearly equidistant from London and Edinburgh. York is the most ancient of British cities. Before the Roman invasion it was *Caer Ebroc*, one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes; and during the Roman dominion it was *Eboracum*, a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine Chlorus. Many mistakenly suppose that Constantine the Great was born here. When the Roman emperors visited Britain, *Eboracum* was their chosen residence, as it was the residence of the imperial legates when the emperors were absent. Alcuin, tutor of Charlemagne's children; Etty the painter; and Flaxman the sculptor were natives of York. The first English parlia-

ment was held at York in 1160 by Henry II and in the immediate neighborhood of the city Fairfax conquered Prince Rupert on Marston Moor during the Civil War. The city and castle, already besieged, surrendered to the parliamentary forces a few weeks after. The educational institutions are both numerous and useful. Notable among them are St. Peter's School, founded in 1557; Archbishop Holgate's free school, dating from Henry VIII; the Blue Coat School for boys and the Gray Coat School for girls; and Yorkshire School for the Blind, conducted in a palace originally built for the lord president of the council of the north. The cathedral of York Minster is one of the glories of architecture. Population 84,730.

York, Pa., county-seat of York County, on Codorus Creek, 100 miles west of Philadelphia and 52 from Baltimore. The Northern Central, Pennsylvania and Western Maryland afford railroad facilities. It manufactures safes, silk, ice-machines, paper, chains, carriages, agricultural implements, wire-cloth, turbine-wheels and other articles. York is noted for its diversified and extensive industries. In addition to public schools it contains an academy for boys, a coëducational institute and three parochial schools. The Continental Congress sat here during the British occupancy of Philadelphia (1777–8) in the Revolutionary War. Population 40,000.

York, H. R. H., **George,** Duke of, second son of King Edward VII of England and heir-apparent to the British throne, was born at Marlborough House, London, on June 3, 1865. With his older brother, the late Duke of Clarence, he entered the navy as a cadet in June, 1877, and spent a number of years in the service, his latest command being on H. M. S. *Crescent*. His royal highness has been in most parts of the world and done duty in various stations of the British fleet. In 1892 he became heir to the throne and in 1901 was created Prince of Wales. In 1893 he married Princess Victoria Mary of Teck. By her he has six children, the oldest, Prince Edward, being born in 1894. In 1901, accompanied by the duchess, the duke paid a visit of state to Australia, New Zealand and Canada, the visit to Australia being designed to commemorate the opening of the first parliament of the new Australian Federation or Commonwealth. In 1908 he visited Quebec at the celebration of its fourth centenary. See WALES, PRINCE OF.

DUKE OF CORNWALL AND YORK

York, a river of Virginia formed by the Pamunkey and Mattapony, flowing southeastward to Chesapeake Bay, nearly opposite Cape Charles. It is 40 miles long and from one to three wide.

York, House of, was founded by Edmund Langley, fifth son of Edward III, being made Duke of York in 1385. Richard, the third duke, claimed the throne of England in opposition to Henry VI, but never succeeded to it himself. After seeking for many years to correct the weaknesses of Henry's government, Richard first took arms against the ill-advisers who were his personal enemies, and at length claimed the crown in Parliament as his right. A compromise was proposed that Henry should retain his crown during his life, and the duke and his heirs succeed after Henry's death. This was accepted both by Henry and by Richard, but the act was repudiated by Queen Margaret and her followers, and the duke was slain at the battle of Wakefield soon after. In little more than two months, however, Richard's son was proclaimed king in London as Edward IV, and the bloody victory of Towton soon after drove his enemies into exile and prepared the way for his coronation. Edward reigned from 1461 to 1483, when Edward V, his oldest son, after a nominal reign of two months and a half, was put aside and murdered by Richard III, his uncle. Richard then became king; but in a little more than two years was defeated and slain at Bosworth (Aug. 22, 1485) by Henry Tudor, Earl of Richmond, who was crowned as Henry VII. His marriage with the daughter of Edward IV (1486) united the houses of York and Lancaster. See ROSES, WARS OF.

York'town, Va., county-seat of York County, is on York River, ten miles from its mouth and about 60 miles from Richmond. Yorktown is noted for the surrender of Lord Cornwallis (*q. v.*) and his army to Washington in 1781, which was the virtual close of the Revolutionary War, and for the unsuccessful siege by General McClellan in the spring of 1862. Yorktown contains the oldest custom-house in the country, and is one of the oldest towns in the United States. Population 221.

Yosemite (*yō-sĕm'ĭ-tē*), a valley in Mariposa County, Cal., on the western side of the Sierra Nevada, about 150 miles from San Francisco, unequaled for grandeur and magnificence of scenery. It is seven or eight miles long and about a mile wide, and is about a mile below the level of the surrounding region. Of its various waterfalls the Bridal Veil is particularly noted for beauty and also for its height, which is nearly 1,000 feet. This valley, which was first

entered by white men in 1855, attracts visitors every year from all parts of the world. Perhaps nowhere else on earth is there so remarkable a combination of beauty and sublimity.

Youmans (*yōō'manz*), **Edward L.,** a distinguished American scientist, was born at Coeymans, N. Y., June 3, 1821; and, although suffering for some years from almost total blindness, he pursued his studies in physics and chemistry with marked zeal and proficiency, his sister conducting experiments for him. Among the works for which he is distinguished are *Class-Book of Chemistry*, *Correlation and Conservatism of Forces*, *Alcohol and the Constitution of Man*, *Handbook of Household Science*, *The Culture Demanded by Modern Life* etc. In 1872 he established *The Popular Science Monthly*, a magazine that has attained wide circulation in Europe as well as in America. He died at New York, Jan. 18, 1887.

Young, Brigham, the noted head of the Mormon church, was born at Whittingham, Vt., June 1, 1801. In 1832, having become a convert to Mormonism, he was made an elder of the church, and began to preach at the Mormon settlement at Kirkland, O. Three years later he was sent as a missionary to New England, where he made quite a number of converts. After the death of Joseph Smith at Nauvoo, Ill., in 1844, Young was chosen president in his place. In 1847 he led his followers to Utah (*q. v.*) and founded Salt Lake City. Here, under his able leadership, the community prospered, other settlements were established, and the foundations of the present state were laid. He died on August 29, 1877, leaving a fortune estimated at $2,000,000. See MORMONS.

Young, Charles Augustus, a distinguished American astronomer, was born at Hanover N. H., Dec. 15, 1834. He was educated at Dartmouth College, where he graduated in 1853. After teaching classics for three years at Phillips Andover Academy, he went to Western Reserve College in Ohio, where he taught astronomy, natural philosophy and mathematics. For three months during the Civil War he served in the 85th Ohio Volunteers. At the close of the war he was appointed to the chair of physics and astronomy at Dartmouth, a position which his father had held some years earlier. During the following 12 years Professor Young made a brilliant series of discoveries in solar physics, among which may be mentioned the "reversing layer" of the solar atmosphere, observed at the Spanish eclipse of 1870, the rotation period of the sun measured on Döppler's principle, the bright line spectrum of the chromosphere (1872) and the motion and forms of solar prominences. In 1877 he was called to the chair of astronomy at Princeton University. He is the highest living authority on the sun, and in 1906 was awarded a Carnegie old-age pension for his brilliant services to science. It is needless to say that he has received many honors, as election to the National Academy of Sciences, degrees and honorary memberships. His published works include *The Sun* (in the International Scientific Series), *General Astronomy*, *Lessons in Astronomy* etc.

Young, Edward, English poet, was born on July 3, 1683, at Upham, Hampshire, where his father was rector. He was educated at Winchester School and afterwards at Oxford. He published several poems and tragedies, but the work by which alone he is remembered is *Night Thoughts*, which has passed through a great many editions, and is more or less familiar to the general reader. A number of his sententious lines have passed into common use and in a manner become proverbial. He died on April 12, 1765.

Young, Thomas, an eminent man of science, was born at Milverton, Somerset, England, on June 13, 1773. He was born of a well-to-do Quaker family, inherited ample means, and was widely educated, not only by university study but by travel, leisure and good society. He was a student successively at London, Edinburgh, Göttingen and Cambridge. Having completed his medical studies at Cambridge in 1800, he at once settled in London as a practicing physician. But in 1801 he was appointed professor of natural philosophy in the Royal Institution. It was during his two years' occupancy of this chair that he published *Outlines and Experiments Respecting Sound and Light*, his most important memoir. In it he shows that two rays of light may be added together to produce darkness — the phenomenon of *interference*. Sir John Herschel asserted that, even if Young had made no other discovery, this alone would have made him immortal as a scientist. It was during this period also that he wrote his *Lectures on Natural Philosophy*, a work which exerted a powerful and healthful influence on physical science during a full half-century. His contributions cover a wide field, including such subjects as physiology, music, hydrodynamics, paleography, theory of structures and tables of mortality. His theory of color-vision, as modified by Helmholtz, is, perhaps, to-day as widely accepted as any of the various views which have been expressed upon this subject. He died at London on May 10, 1829. Dr. Peacock has published an interesting *Life of Young*, and has edited his *Miscellaneous Works*. But all of Young's more important contributions are reprinted in his *Lectures on Natural Philosophy*.

Young Men's Chris'tian Asso'ciation This is an organization having a branch in

most of the leading cities (and in some smaller towns) in the United States Great Britain and scores of other countries, whose special object is to promote the welfare of young men. The condition of active membership in this organization is membership in some Evangelical church; but young men not members of churches are admitted as associate-members and are entitled to all the privileges of the association, except a voice in the election of its officers. In addition to various religious services the Association generally provides a library and reading-room (open to the public), a gymnasium, bathroom, lectures, special instruction and proper amusements; and its power for good has been demonstrated so clearly as to command universal recognition. The first association organized in the United States was at Boston in the winter of 1851-2, but on account of the Civil War the growth of the institution hardly began until 1866. In 1906 there were in North America 1,952 associations in cities and towns, 577 in universities and colleges, 161 among railroad men, 321 with the army and navy, 86 among the negroes and 43 among the Indians, making a total of 1,997 associations, with 405,789 members. In 400 associations special work was carried on for boys. The associations own and occupy on this continent 589 buildings valued at $34,132,245, with 654 libraries, containing 555,320 volumes; and there were 2,500 secretaries at the heads of the various branches. There are nearly 8,000 associations in the world. See WILLIAMS, SIR GEO. W.

Young's Mod'ulus. See ELASTICITY.

Young'stown, O., county-seat of Mahoning County, on the Mahoning River, 67 miles from Cleveland and 64 from Pittsburg. Being in a coal and iron region, it has become a very important manufacturing center, having rolling-mills, blast-furnaces, steel-plants and allied industries, producing boilers, bridges, cars, cranes, engines, forgings, machinery and steel-castings. It also manufactures automobiles, brass-castings, flour, leather and powder, and has oil-cloth and rubber-plants. The buildings of most note are Dollar Savings and Trust Company, the Y. M. C. A. building, the City Hospital and Memorial Kindergarten. The city has excellent public and parochial schools, a high school (Rayen School) and several private schools. Here are McMillan Library and Rayen School Library. There are many churches representing several denominations. Population 59,716.

Young Women's Christian Association is an organization which seeks to help young women by providing for their physical, social, mental and spiritual wants. The means used are Bible training-classes, evangelical meetings, personal religious work, libraries and reading-rooms, classes in various studies, musical and literary entertainments, socials and receptions in home-like rooms, helpful companionships and holiday excursions. There is a special department for young women of colleges. In 1891 there were 1,000 associations in Great Britain; 50 on the continent of Europe; 20 in India; 25 in Australia; 225 in America; and in other places, including China and Japan, 175. The total in the world was 1,500. In 1901 America had 74 city and 409 student associations, with a membership of 49,175. There now are associations affiliated with the American committee in 552 colleges and 104 cities, with 24 state organizations. Each state holds an annual convention. The membership of local associations connected with the American committee is 100,252. The international association was formed in 1886. The work is controlled by an international committee of 46 members. Twenty-one states had organized state associations in 1901. The state associations hold conventions yearly, and the international convention meets every two years. *The Evangel* is a monthly organ of the associations, published at Chicago.

Ypsilanti (*ĭp'sĭ-lăn'tĭ*), a city in Washtenaw County, Michigan, on the Michigan Central Railroad, 30 miles west of Detroit. Considerable manufacturing is carried on, and it is a prominent educational center, being the seat of Michigan Normal School, one of the leading educational institutions of the country. Population 7,378.

Yucatan (*yōō'kà-tăn'*), a peninsula of Mexico, bounded on the west and north by the Gulf of Mexico, on the east by the Caribbean Sea and on the south by Guatemala. It comprises the states of Yucatan and Campeche. The eastern coast is indented with numerous bays, some forming excellent harbors. The face of the country is low and level, except in the east, where a chain of hills extends from northeast to southwest. The only important river is the Usumasinta. The soil in some portions is very fertile, yielding abundant crops of maize, rice, tobacco, sugar-cane and other agricultural products. According to a law that now is enforced education is free and compulsory. The primary schools, though mainly supported by the states and cities, receive governmental grants, and there are secondary schools, seminaries and colleges for higher education. The area of the peninsula is 53,299 square miles. Population of the peninsula 400,629. Merida, the capital of Yucatan, has a population of 43,630.

Yucca (*yŭk'kà*) **Moth,** a small moth which gathers pollen and fertilizes the yucca-plant. A very remarkable relation has been shown to exist between this moth and the plant. The yuccas are lily-like plants, of which the Spanish bayonet is an example. The

stamens are so placed that the pollen cannot get into the tube of the stigma without artificial aid. The plant is sterile without the moth, and the larvæ of the latter feeds on the seeds, so that, in fertilizing the plant, the mother moth is providing for her offspring. The female moth (*Pronuba yuccasella*) is about half an inch long and of silvery white color. She begins her operations after dark, and, in setting about to provide for the future generation, she first collects a pellet of pollen with her jaws and fore legs. She then begins to deposit eggs in the walls of the unripe fruit-pod, using her lance-like ovipositor to penetrate the outer covering. She then goes to the tube of the stigma, which leads into the fruit-pod and thrusts pollen down it, using her tongue to push the pollen toward the undeveloped seeds. The larvæ are hatched and feed upon the developing seeds, but as not all of these are consumed, the double purpose has been effected of fertilizing the plant and providing food for her young. Consult *The Yucca Moth and Yucca Pollination, Missouri Botanical Garden Report for 1892.*

Yukon (*yōō′kŏn*) **Territory, Can.,** the most important part of northern Canada at present. It extends from the northern boundary of British Columbia to the Arctic Ocean and from the Rocky Mountains to Alaska, U. S. A. It is about 650 miles from north to south by 550 in greatest breadth from east to west. Although it does not touch the Pacific, its southern boundary is only 30 miles from tidewater. A railway of 110 miles connects at Skagway, the head of tidewater in Alaska, with White Horse at the head of steamboat navigation on Yukon River. This is navigable for large steamers from White Horse through Yukon Territory and Alaska to Bering Sea, a distance of 1,630 miles. Yukon is important because of the gold discoveries on Klondike River in 1897. There had been gold-mining on a small scale on Stewart and Forty Mile Rivers, but in 1897 remarkably rich discoveries were made in two streams flowing into the Klondike, a tributary of the Yukon, and in some adjacent streams. The stampede which followed was one of the most remarkable the world has known. Since that time over $100,000,000 in gold have been taken out, and investments of many millions are now being made in the expectation of taking out one hundred million dollars more in the next few years. There are placer-mines in active operation in widely separated portions of the territory, and silver, copper, quartz and coal mines as well. Dawson, the capital, is on the Yukon at the mouth of the Klondike. Although Yukon is only a few miles south of the Arctic circle, the climate in summer is very pleasant, and hardy vegetables, as turnips and cabbages grow very well. Below the surface the ground in the northern part of the territory is always frozen, but the surface is not frozen from April to October inclusive. Population 8,000.

Yukon, a river rising in the Dominion of Canada and flowing through Alaska into the Pacific at Norton Sound, its total length being about 2,000 miles.

Yu′ma, the southwestern county of Arizona, U. S. A., lying directly north of Mexico. It is intersected by Gila River and is separated from California by the Colorado. The valleys, when irrigated, are fertile, but the rest is desert. Yuma, the county-seat, with 1,402 inhabitants, stands on the eastern bank of Colorado River. See ARIZONA.

Yumas, a tribe of American Indians, very few in number, occupying the territory on both sides of the Colorado near its junction with the Gila.

Z

Z (*zē, zěd, ĭzzērd*), the twenty-sixth letter, is a voiced consonant. It is a dental, *zh* a palatal. Ordinarily it has a buzzing sound, as in *zone, dizzy, buzz.* *Z* in some words has the sound of *zh*, as in *azure.* Its own sound is more often represented by *s* than *z.*

Zacatecas (*să'kà-tā'kàs*), capital of the Mexican state of that name, lies in a deep valley or ravine, somewhat over 300 miles from the City of Mexico. It is built over a vein of silver which has been deeply explored. The streets are somewhat narrow and crooked, but it has a fine appearance from a distance, owing to the size and massiveness of its churches and the elegance of many of its residences. Population 32,856; of the state 447,265.

Zahm, John Augustus, born at Lexington, O., June 14, 1851; graduated at Notre Dame University and joined the Congregation of Holy Cross in 1871; became a priest in 1874; and was Provincial of his order in the United States from 1897 to 1906. He studied and experimented with Helmholtz in Germany, and is a leading authority on acoustics; his first book, *Sound and Music* (1893) popularized that subject and greatly aided musical science. He is known as an advanced evolutionist, but his works aim only to show the harmony between demonstrated science and the Christian religion. They are *Evolution and Dogma; Catholic Science and Catholic Scientists; Scientific Theory and Catholic Doctrine; Science and the Church.* His brother, a layman, Albert F. Zahm, Ph. D., professor of physics at the Catholic University of Washington, D. C., is a noted authority on aërodynamics, and has been of great service to aëronautical investigators.

Za'ma, The Battle of, was fought about 100 miles southwest of Carthage in B. C. 202, between the Romans under Publius Cornelius Scipio and the Carthaginians under Hannibal. The Carthaginians were completely defeated, and Hannibal became a fugitive until his death. There were two places, about 30 miles apart, called Zama. The scene of the battle according to Polybius, lay west of Carthage, at a distance of two days' journey. Some authorities locate the battle at the other Zama, perhaps five days' journey from Carthage.

Zambezi (*zàm-bā'zē*) **River and Region,** the extensive region in southeastern Africa known to medieval geographers under the general name of the empire of Monomotapa, is shown on old maps as drained by a river, called Zambese or Zambere, which plainly is the modern Zambezi. Although the lower region of the Zambezi, for at least 300 miles from its mouth, has nominally been in possession of the Portuguese since the beginning of the 16th century, it is only within the last half of the 19th century, through the reports of Livingstone and other explorers, that we gained any definite knowledge of this vast region, the total length of whose river is 1,650 miles. The river bears the name of Zambezi from its mouth to its junction with the Chobe; thence to its junction with the Liba, coming from Lake Dilolo, it is called the Liambai. Part of the upper basin of the Zambezi was explored by Major Serpa Pinto in 1878–9. In the region where the Liba joins the Liambai the main stream is 200 or 300 yards wide and quite deep. From the confluence to Victoria Falls there are many long tracts that could easily be plied by large steamers. Lake Dilolo, from which the Liba flows, seems to have an outlet both to the north and to the south, the northern outlet probably running into one of the tributaries of the Kongo. Large areas in this region are liable to be flooded and to stand under water for considerable periods at a time. Victoria Falls are about 2,500 feet above the sea, while Lake Shirwa, a smaller lake southeast of Nyasa, is 2,000 feet. The natives inhabiting the coast region drained by the Zambezi are of the pure negro type, while the Kololo who were found in the central and upper country, belong to the Betjuana family. According to Pinto this tribe long ago ceased to have separate existence. On the upper Zambezi Pinto discovered a tribe of yellowish white color. The Zulu tribe, who inhabit the high region dividing the Limpopo from the Zambezi basin, have overrun and conquered nearly all the tribes south of them. The possession is governed by the Mozambique and Nyasa Companies, and the Zambezia Company carries on industrial, commercial, agricultural and mining operations, while the Mozambique Sugar Company has plantations on the lower Zambezi. The Zambezi is navigable for stern-wheelers as far as Tete. The ports of Portuguese East Africa are visited regularly by the steamers of the German East Africa line, and on the Zambezi and Shiré Rivers many small steamers ply. The Delagoa Bay

Railway has a length of 57 miles in the colony, and is continued for 290 miles to Pretoria. Beira Railway has a length of 204 miles in the colony, and is continued from the British frontier to Bulawayo. See CENTRAL AFRICA PROTECTORATE, NYASALAND, PORTUGUESE EAST AFRICA and RHODESIA. The military force of the colony is 4,888 men, three fourths of whom are natives.

Zambezia. See PORTUGUESE EAST AFRICA and RHODESIA.

Zanes'ville, O., county-seat of Muskingum County, on both sides of Muskingum River, at the mouth of Licking River, 55 miles east of Columbus, is in a beautiful and fertile valley, and is crowded with manufactures and other business enterprises. Having fine railroad and river facilities, it is a prosperous and busy city. It has rolling-mills, blast-furnaces, brass and iron foundries, glass and soap factories, flour, woolen and paper mills, railroad and other machine shops, tile-works and extensive potteries making fine ware. It also has tanneries, breweries, bent-wood works and brick-yards, and manufactures agricultural implements. The Y bridge spanning the Muskingum and Licking Rivers is the only structure of its kind in the United States. Among the prominent buildings are the Masonic Temple, the People's Savings Bank, Soldiers' and Sailors' Monumental Building, the two opera-houses and Zanesville High School. The city has an admirable system of public and parochial schools, a business college, an academy (R. C.), many churches and McIntire Home for Children. Zanesville was settled in 1799, and was the state capital from 1810 to 1812. Population 28,000.

Zang'will, Israel, British novelist and *littérateur*, of Jewish origin, was born in London in 1864 and educated at the Jews' Free School, Spitalfields. He has travelled much, chiefly on lecturing tours, visiting not only the chief places in Europe and in Palestine but the United States. His writings, besides his Jewish stories, as *Children of the Ghetto* and *Ghetto Tragedies* include several plays, the chief ones being *Merely Mary Ann* and *Nurse Marjorie*, both of which have appeared on the American stage. After teaching, Zangwill for a time was a journalist, founding *Ariel or The London Puck* in 1889. Then he took to writing novels and to miscellaneous literary composition. His more notable works include *The Bachelor's Club*, *The Big Bow Mystery; The Old Maid's Club*, a satire; *The King of the Schnorrers; The Master; Dreamers of the Ghetto; They that Walk in Darkness;* and *The Mantle of Elijah*, the latter being also dramatized. He has, moreover, published essays entitled *Without Prejudice;* some verse; humorous political effusions under the title of *The Premier and the Painter;* and gossipy criticisms entitled *Men, Women and Books*, the latter appearing in *The Cosmopolitan* of New York City. He is interested in the colonizing of Jews in British East Africa and is connected with the Zionist movement.

Zanzibar (*zăn'zĭ-bär'*) or **Zanguebar,** an Arab sultanate under British control, comprises the islands of Lamu, Mafia, Pemba and Zanzibar on the eastern coast of Africa opposite the German sphere. The sultan is titular sovereign of the coast of British East Africa for ten miles inland, but it is administered by the British. The island of Zanzibar, about 50 miles in length and from 15 to 30 in breadth, is the most important of the sultan's dominions. It contains an area of 640 square miles, and the soil in most parts is exceedingly fertile. The principal products are cocoanuts, cloves, rice, sugar-cane and fruits. Pemba produces four fifths of all the cloves in the world. The population of the island is estimated at 250,000 and that of Pemba at 50,000, among them many foreigners, for the most part engaged in trade. The town of Zanzibar has 100,000 inhabitants. The soil along the coast is fertile in rice, millet, peas, beans, melons, pumpkins, sugar-cane, cocoanuts and bananas, and the forests supply many valuable species of timber. Cattle, sheep and fowls are plentiful, and wild animals abound. The heat on the coast is excessive, and the climate is unfavorable to Europeans and Americans. The protectorate has had a regular government since October, 1901, with a responsible ministry. Its revenues are derived chiefly from customs-duties and taxes on produce. The chief imports are cottons, rice, groceries and petroleum; the chief exports, cloves, cottons, copra, ivory and grain. Zanzibar is in direct communication with Great Britain by cable. Mohammedanism is the prevailing religion, and European immigration is restricted, but Zanzibar is a center for trade, missions and exploration. The Arabs of Muscat acquired the East African coast between 1698 and 1807, partly by conquest from the Portuguese, partly from the Africans, but Zanguebar became independent in 1856. Between 1886 and 1890 the Germans and British divided the continental dominions between them, Germany paying the sultan $1,000,000 for his rights.

Ze'bra, a striped animal of Africa related to the wild ass. The true or mountain zebra inhabits mountainous regions in Cape Colony. Owing to the persecution of hunters, it is scarce now and is fast being exterminated. It is about four feet high at the shoulders. Its general color is white, with black stripes on the body, limbs and tail. Those on the limbs extend to the hoofs and those on the tail to the tuft of hair. Burchell's zebra is a larger and more robust

animal, with a longer mane and a fuller tail. Its general ground-color is pale yellowish brown. The stripes are dark brown or black, but do not extend so far on the limbs and on the tail as they do in the mountain zebra. The zebra has never been successfully domesticated. Experiments

ZEBRA

have proved that it can be made to work well in harness, if properly treated, but general improvement and making use of it seem impossible of attainment. The flesh is eaten by the natives, and the hide is used for leather. The quagga (*q. v.*) is not a true zebra.

Ze'bu, the name sometimes used for a humped ox of India (*Bos Indicus*). This name, however, is not used in India, being an invention of foreign people. The zebu is closely related to the domesticated ox. It no longer is found in the wild state. The animal possesses a well-marked hump of fat on the shoulders, which is considered a delicacy for the table. It has long ears pointing downward and very short blunt horns. The cows are milked. These animals are used in plowing, for drawing carriages and for riding. Similar animals are found in China and in eastern Africa. The sacred bulls of the Hindus belong to this species.

Zechari'ah, one of the ancient Hebrew prophets, was born in Babylonia during the captivity, and accompanied the exiles on the return to Jerusalem under Zerubbabel and Joshua. Very little is known of his history, but there is enough to show that he was a man of great influence and combined the functions of priest and prophet. His prophecies may be divided into three parts. The first eight chapters consist mainly of a series of visions relating to the building of the temple and the glory that shall result for Jerusalem; the second portion, chapters ix-xi, threatens Damascus and Phœnicia with ruin and predicts that Judah will be greater than Javan (Greece) and that both Egypt and Assyria will be humbled; while the remaining portion sets forth that dark times are before Judah, which shall be an ordeal for the nation, after which a millennium of holiness will be ushered in. "In that day upon the bells of the horses shall be *Holiness unto the Lord;* and the pots in the Lord's house shall be like the bowls before the altar. Yea! every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts."

Zee'man Effect, an important relation between light and magnetism, discovered by Zeeman of Holland in 1897. This relation is as follows: Zeeman found that if a flame colored with ordinary table-salt — the so-called sodium flame — is placed between the poles of a strong electromagnet and examined with a powerful spectroscope, the appearance of the sodium lines is very much changed. Later investigations show that spectral lines are tripled when the source of light is in a magnetic field and also that the components of the triplet are polarized. For details consult Michelson's article in *The Astrophysical Journal,* Vol. VII, pp. 131–8 (1898).

Zeis'berger, David, a Moravian missionary, born in Moravia, April 11, 1721, who, after emigrating to America and living in Georgia a number of years, became one of the founders of the Moravian colony at Bethlehem, Pa., in 1740. Soon after this he became a missionary to the Indians, laboring zealously at various places in the colony. In 1772 he explored the Tuscarawas valley in Ohio and laid out a town, about ten miles from the present town of Canal Dover, being joined soon after by a number of Moravian Indians from Pennsylvania. In 1781 this settlement was broken up, and Zeisberger and his Indians were compelled to move to Sandusky, but in 1798, when Congress granted to the Moravian Indians the tract on which they had formerly lived on the Tuscarawas, a portion of them returned and formed a new settlement, which they named Goshen. Here Zeisberger died on Nov. 17, 1808.

Zem'stvos, district and provincial assemblies in European Russia, established by Emperor Alexander on Jan. 1, 1864. Under certain restrictions they administer the economic affairs of districts and provinces, under *Upranas.* They are composed of representatives elected by the peasantry, the householders of the towns and the landed proprietors. By the law of June 12, 1890, important modifications were introduced, increasing the powers of noble landowners in the affairs of the *zemstvos* and suppressing the right of peasants to elect deputies to the *zemstvos* (they present candidates out of whom the governor of the province names a deputy), thus reducing the number of representatives and limiting their powers. The institutions of the

zemstvos are in force in 34 provinces (361 districts) of European Russia. The towns and cities have municipal organizations of their own, organized on nearly the same principles as the *zemstvos* by the law of June 16, 1870. Consult *The Statesman's Year-Book:* Russia. See DUMA.

Zend-Aves'ta. See LITERATURE, PERSIAN.

Zen'ith. See NADIR.

Ze'no, founder of the Stoic philosophy, was born at Citium in Cyprus, the dates of his birth and death being both uncertain. He flourished in the early part of the 3d century B. C., and was a contemporary of Epicurus. At 30 he was shipwrecked, and, having lost his property, adopted the doctrines of the Cynics, in which contempt for riches is conspicuously taught. Having made himself master of the various schools, he proceeded to open a school of his own, in which he might bring forth the results of his inquiries and develop his own peculiar system. He selected for his purpose the Painted Porch; and there until his death continued to teach those doctrines which, in spite of many objectionable features, inculcate the manly energy and simplicity, the patience and fortitude and the reverence for moral worth which made disciples of so many noble Roman characters. The Athenians honored Zeno's memory with a golden crown and a public burial, and his countrymen erected a monumental pillar in his honor. Scarcely any portion of his numerous writings has been preserved. He is supposed to have died about 264 B. C.

Zeno'bia, queen of Palymra, in 267 A. D., succeeded Odenathus, her husband, who had been acknowledged by Gallienus in the sovereignty of the Palmyrene empire; but when Aurelian became emperor he marched against her with a large army, and after defeating her in several battles besieged her in Palmyra. She attempted to escape by flight, but was captured and brought to Rome to adorn the triumph of her conqueror. After this she was presented by Aurelian with large possessions near Tivoli. There the remainder of her life was passed. She was a woman of great courage, high spirit and remarkable beauty. With purity of morals in private life she combined prudence, justice and liberality in her administration of public affairs. Consult Gibbon's *Decline of the Roman Empire* and Ware's *Zenobia.*

Zeus (*zūs*) was the greatest of the Hellenic deities. According to the most generally received mythology, he was the son of Cronos and Rhea and the brother of Poseidon and Hera, the latter being his wife. He expelled his father and the older dynasties of the Titans, assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. After the dethronement of the Titans Zeus was allotted the empire of heaven and air, Hades of the infernal regions and Poseidon of the sea, while the earth was left under the power of the three. Crete, Dodona and Arcadia were the places where the worship of Zeus was most observed; and in process of time all the local gods worshiped under the name of Zeus were merged in one Hellenic divinity, who was afterward identified with the Jupiter of the Romans and the Ammon of Libya. Zeus was the father of gods and men, protector of kings and supporter of law and order, the avenger of broken oaths and other offenses; he watched over the state and the family and over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and regulated the whole course of nature. He dispensed both weal and woe to mortals; but the ancients disagreed as to his power over the fates themselves, as has always been the case when men have "reasoned high on fixed fate, free will, foreknowledge absolute."

Zil'leh, a town in Asiatic Turkey, about 30 miles from Tokat. This was the scene of Julius Cæsar's battle with Pharnaces, concerning which he wrote the famous report: *Veni, vidi, vici* (I came, I saw, I conquered). Scarcely any remains of antiquity are to be found, a fortress of the middle ages having been constructed on the site of its beautiful temple. The town contains about 2,000 houses, the population being mostly Turkish.

Zinc or **Spelter,** as it is often called in commerce, is a hard, bluish-white metal, lustrous on its surface. When broken, it exhibits a crystalline fracture. At ordinary temperatures it is somewhat brittle, but when heated above 212° F. it becomes so ductile and malleable, that it may be drawn into wire or rolled into thin plates. Since the discovery of this quality the uses of this metal, which formerly was employed chiefly in connection with copper in the manufacture of brass, have greatly extended. It is used for roofing, spouting, baths, water-tanks and for covering ships' bottoms instead of copper. As a material for casting artistic works zinc has the desirable properties of a low melting-point and of taking a sharp impression from the mold, so that it requires little labor from the chaser. It also possesses considerable hardness. It has, therefore, become a favorite material for making casts of statues and different kinds of ornaments. Another important use of metallic zinc is in the cells of electric batteries, in many of which the dissolving of the zinc is the source of energy. Zinc-oxide, a white powder, is extensively used as a pigment Other compounds of zinc, as the chloride and the sulphate, are used in medicine.

Zinc-Etch'ing, a favorite process for reproducing pen-drawings or engravings

in white and black. A photograph is taken of the drawing or engraving which is to be copied, and the negative is placed over a zinc or copper plate, which has been covered with a varnish, and is then exposed to the light. The varnished portions which are exposed to the light become insoluble, while the parts protected by the lines of the photograph remain soluble. The plate is then treated with an acid solution by which the soluble portions of the varnish are removed and the lines of the drawing or engraving are etched or eaten into the metal. Consult Hamerton's *Etcher's Handbook* Herkomer's *Etching* and Kohler's *Etching*.

Zinc-White or **Chinese White,** a hydrated oxide of zinc, used as a pigment in lieu of white lead. As a body-color it is largely used in water-color painting.

Zi'on, Mount, the name of the hill on which stood the southwestern part of Jerusalem, called the City of David or Upper City. At the present day the city-wall runs obliquely over the hill, so that only the northern half is included in the city. On the west and still more on the south it descends steeply into the Vale of Hinnom, 300 feet. Mount Zion is 2,500 feet above the sea. With the prophets and poets of the Old Testament it stands for the whole of Jerusalem (often called Daughter of Zion), particularly in reference to the temple.

Zi'onism and the Zi'onist Movement. Of recent years there has been much discussion over the project, embodying the Jewish nationalistic ideal, to acquire and settle in Palestine, on an autonomous basis, a home for the Jewish race. The more notable men interested in this Zionist project include, among others, Dr. Max Nordau, Israel Zangwill, the English novelist, Dr. Marmorek, head of the Pasteur Institute in France, and Prof. Richard Gottheil in this country. With this object in view congresses have met and leagues have of late been formed whose object, as it has been said, is to secure "the provision of a territory upon an autonomous basis for those Jews who are unable or unwilling to remain in their present lands, and [the movement] pledges itself to promote the acquisition of a legally assured place for Jewish settlement." When the scheme is ripe, a Jewish loan is promised to be raised for their extradition and otherwise to help them. In aid of the contemplated project a congress has of late been held at Basle, but it came to no immediate practical result, on account of a split in the assembled body, one section adhering to the idea of settlement only in the Holy Land, while another considered the offer of the British Government of a large territorial area in East Africa. Favoring the movement is also that of Zangwill, entitled The Jewish Territorial Organization and intended, if at all practicable, to settle in Palestine. Another and similar scheme has, moreover, been set on foot, entitled The London Zionist League, whose object is, if practicable, legally to secure and publicly to recognize a home in Palestine for national regeneration, preliminary to other definite and practical efforts.

Zis'ka, John, the famous leader of the Hussites, was born at Trocsznow, Bohemia, about 1360. While a mere boy he became a page to King Wenceslaus of Bohemia, but soon after embraced the career of arms and distinguished himself in the war against the Teutonic Knights. Returning to Bohemia after the murder of John Huss, Ziska soon became prominent among those who sought to resist the decisions of the Council of Constance. After the outbreak at Prague in 1419 Ziska was unanimously chosen leader of the Hussites, and the first great religious conflict in Germany began in earnest. When Emperor Sigismund — who had allowed his safe-conduct to Huss to be violated — advanced an army of 40,000 men into Bohemia to obtain possession of the throne, his project was frustrated for a time by the Hussites, who defeated his army with a hastily levied force. The war against Sigismund was continued with the utmost vigor by Ziska, even after he became blind, until Sigismund became convinced that the conquest of Bohemia was impossible. He therefore proposed an arrangement with the Hussites, by which full religious liberty was allowed to them and Ziska was to be their governor, King Wenceslaus having died soon after the war broke out. But the war-worn chief did not live to complete the treaty. While besieging the castle of Przibislaw he was seized with the plague and died on Oct. 11, 1424. He was buried in a church at Czaslav, and his iron war-club was hung over his tomb.

Zo'diac, an imaginary zone of the heavens, within which lie the paths of the sun, moon and principal planets. It is bounded by two circles equidistant from the ecliptic — about 18° apart; is divided into 12 signs; and is marked by 12 constellations. The signs are geometrical divisions 30° in extent, counted from the vernal equinox in the direction of the sun's progress through them. The whole series accordingly shifts westward through the effect of precession by about one degree in 72 years, requiring 25,868 years for a complete circuit. At the moment of crossing the equator toward the north the sun is said to be at the first point of *Aries* (Ram); some 30 days later it enters *Taurus* (Bull); and so on through *Gemini* (Twins), *Cancer* (Crab), *Leo* (Lion), *Virgo* (Virgin), *Libra* (Balance), *Scorpio*

(Scorpion), *Sagittarius* (Archer), *Capricornus* (Goat), *Aquarius* (Water-Bearer) and *Pisces* (Fishes). The constellations bearing the same names coincided approximately in position when Hipparchus observed them at Rhodes, more than 2,000 years ago, with the positions they designate. The discrepancy now, however, amounts to the entire breadth of a sign, the sun's path in *Aries* lying among the stars in *Pisces;* in *Taurus* among those of *Aries;* in *Gemini* among those of *Taurus* etc. This gradual retrogression of the signs through the constellations of the zodiac will continue till in about 25,868 years they accomplish a complete circuit. After this period the sign and constellation of *Aries* will coincide as they did in the time of Hipparchus.

Zodi'acal Light. If an observer in the tropical regions of the earth on a clear, moonless night watches the western sky from sunset till the last trace of twilight has disappeared, he will notice that the twilight seems to linger longer near the point where the sun sank below the horizon and that gradually a nebulous band of light, broad toward the horizon and narrowing, first rapidly and then more slowly upward, begins to stand out clearly from the vanishing twilight, which spreads along a much wider arc of the horizon. This is the zodiacal light. When seen on a perfectly clear night, it will be noticed that it fades imperceptibly on both sides and toward the vertex and that its light is distinctly brighter toward the base than at higher points. Its width at its base may be said to vary from 10° to 30°, and the height of its vertex from 40° to 90°. It is most clearly seen in our latitude during the spring months after sunset and in the autumnal months before sunrise. This is due not to any change in the light itself, but to the fact that at other seasons of the year the ecliptic makes so small an angle with the horizon that light lying in or near it does not rise sufficiently high above the mists of the horizon to be seen after the twilight has vanished.

Zo'la, Émile, French novelist, was born at Paris, April 2, 1840, of a French mother and an Italian father, an eminent civil engineer. His distinguished son spent his boyhood at Aix, and was educated at *Lycée St. Louis.* Settling in Paris, he for a time was in the employ of Messrs. Hachette, the well-known publishing firm. His first venture in fiction was *Les Mystères de Marseille,* and in this and in *Thérèse Raquin* he at once displayed power in the critical analysis of human character. Soon after this he formed the naturalistic school of fiction, with Flaubert, Daudet and the Goncourts, chiefly marked by a hideous though powerful delineation of the crimes, weaknesses and loathsomeness of Parisian social life. The fruit in part of this was the series known as *The Rougon-Macquart Family,* modelled somewhat after Balzac's *La Comédie Humaine.* The more notable subsequent stories are *L'Assommoir, Nana, Pot Bouille, La Joie de Vivre, Au Bonheur des Dames, Germinal, La Terre, La Bête Humaine, La Débâcle* and *Le Docteur Pascal.* Their nastiness is somewhat sweetened by *La Rêve* (The Dream) and by a love-story entitled *Lourdes.* The latter forms one of a trilogy, which Zola called *Les Trois Villes — Lourdes, Rome* and *Paris* — all in the extreme realistic vein. His latest work, written in exile, occasioned by his courageous advocacy of the famous Dreyfus case, was entitled *Fécondité.* He was a knight of the French Legion of Honor, but was refused admittance to the French Academy. He died on Sept. 29, 1902.

Zone, literally a belt or girdle, a portion of the surface of a globe or sphere lying between any two circles of the same whose planes are parallel to each other, or that portion of the surface of a sphere cut off by the plane of a circle. As the earth's axis is inclined 23½° to the plane of the ecliptic or the sun's apparent path around the earth, the tropics of Cancer and Capricorn are located that distance north and south of the equator, respectively; and for the same reason the Arctic Circle and the Antarctic Circle are located 23½° from the north and south poles respectively. These circles are accordingly said to divide the earth's surface into five zones: to wit, the North Frigid, lying north of the Arctic Circle; the North Temperate, lying between the Arctic Circle and the Tropic of Cancer; the Torrid, lying on both sides of the equator, between the Tropic of Cancer on the north and the Tropic of Capricorn on the south; the South Temperate, lying between the Tropic of Capricorn and the Antarctic Circle; and the South Frigid, lying south of the Antarctic Circle. The area of a zone on any sphere is equal to the circumference of a great circle multiplied by the height of the zone.

Zoöl'ogy, the science of animal life. The scope of this subject broadened greatly in the latter half of the 19th century, and it came to include questions that might not at first sight appear to have a direct connection with zoölogy. For example, certain discoveries (those of Von Lenhossék) as to the nervous system of the earthworm opened the way to generalizations regarding the nervous system of higher animals, including that of the human body. Again, the studies of zoölogists on cells are helping to solve broad questions of development and heredity. Thus zoölogy comes into direct relation with the work of the anatomist, the physiologist and the psychologist. This relation is so close that medical schools are asking for a prepara-

tion in zoölogy as an introduction to medical studies. One impression that has gained wide currency should be corrected: *viz.*, that the chief business of the zoölogist is to know the different kinds of animals and be able to name them. That is zoölogy of the past, but it has been replaced by a better kind. Attention has been directed from the external appearances of animals, as shape, color, differences in horns, hoofs etc., to their internal structure and life processes. An attempt is being made to analyze their vital activities and to determine their position in the history of the universe. An examination of the textbooks of a generation ago will show that emphasis was unifomly placed on the classification of animals. In this period, also, the collector for museums and the hunter naturalist were dominant types of zoölogists. It is quite true that students of zoölogy should not be drawn away from the fields, forests and streams; nevertheless, that which is best and strongest in modern zoölogy is being worked out in the laboratory by experiments and observations on a few forms. These studies, especially in the last half of the 19th century, are leading to large generalizations regarding the science of life, which should become known to all people of liberal culture.

Zoölogy as a science aims to give a picture of animal life on the globe; to consider its structure; to analyze its activities; to account for it by tracing its history in general and in detail; and to consider its relation to nature at large. The history of biology includes that of zoölogy, and the article on biology should be consulted, where a number of general considerations are entered upon that need not be repeated here.

The new way of looking at the animal world did not come all at once, but has been the result of growth. Knowledge regarding animal life has advanced by a series of steps, and its progress can be divided into a number of periods. The first of these is the period extending from the earliest writings about animals to the renaissance of science in the 16th century. Zoölogical study was cultivated among ancient peoples and reached its highest development in that period in the work of Aristotle, the Hellenic philosopher-naturalist, who lived from B. C. 384 to B. C. 322. He was a man of truly scientific mind and made many original observations on the structure and development of animal life. With him classification was based upon structure, but was of secondary importance. His successors did not reach the level of the great Father of Natural History, as he has been called. Their work more and more took the line of systematic classification of animals, and lost in observations on structure and development. Pliny the Elder (A. D. 23-79) is the next prominent naturalist of antiquity. That Roman general and teacher has been unduly praised as a zoölogist, for he merely was a poor compiler, who mixed borrowed facts, fancy and fabulous stories. He replaced the natural classification of Aristotle by a highly artificial arrangement of animals, according to their place of abode on land or in water or in air. It is noteworthy that nothing of importance was added to the work of Aristotle till the awakening of observation in the 16th century.

In the intervening period the intellectual life of mankind took a retrograde movement. Observations and inquiry into nature were discontinued and, in fact, were discouraged by intellectual leaders. This led to superstition in reference to the natural universe. But an awakening came, and it was an epoch of unusual importance when men began once more to observe and experiment and so to lay the foundations of modern science. The new intellectual movement was led in the 16th century by Galileo, Descartes and Vesalius. The work of Vesalius (1514-64) in anatomy (*q. v.*) had great influence upon the development of zoölogy. Progress in anatomy helped zoölogy by giving a knowledge of structure. At first structural studies mainly were on the higher animals nearest man. Afterwards they were extended to other forms, including the invertebrates, and were made broadly comparative.

At the revival of learning the influence of Aristotle was mainly on the systematic classification of animals. His works were translated and extended by Wotton (1492-1555), Gesner (1516-65), Aldrovandi (1522-1605) and others who produced ponderous Latin treatises on natural history. These men and their successors for about two hundred years have been called the encyclopedists. The work of Gesner was of fine quality, and marks the beginning of careful observation and description of animals.

Passing over the notable work of naturalists like Malpighi (1628-94), Leeuwenhoek (1632-1723) and Swammerdam (1637-80) in the 17th century, who worked on minute anatomy and brought the microscope into use, we come to the period characterized by the work of Ray (1628-1705), Linnæus (1707-78) and Buffon (1707-88). Ray laid the foundations upon which Linnæus built. The name of the latter probably is more widely known than that of any other naturalist. He was a man of prodigious industry, filled with a zeal for collecting and naming natural objects. He greatly extended the number of known animals and plants, but did little toward deepening the knowledge of animal life. His chief service was in systematizing the groups and introducing the method of naming

animals and plants still in use. *Systema Naturæ*, his great work, was first published in 1735, and reached the 12th edition in 1768. Buffon was a man of more philosophical mind than Linnæus. He also was a graceful writer and created a popular interest in natural history. He must not, however, be thought of as a mere popular writer; he opened new fields and led the way in matters of great importance. He paid much attention to the geographical distribution of animals, and for the first time treated the natural history of the various races of mankind scientifically. He reflected upon the relationship of animals, and is recognized as one of the early evolutionists. This particular line of thought was carried further by Lamarck (1744-1829) and St. Hilaire (1772-1844), the most noteworthy predecessors of Darwin.

The next phase of advance is marked by devotion to the study of structure. The first step in understanding a machine is to observe its parts, to know their relation and how they act on one another. That the animal machine is very complex will be admitted by the casual observer in respect to the higher animals, but there is a complexity about the simpler ones that is not generally appreciated. As Huxley said, when an oyster is swallowed few people realize that there passes the lips an organism more complicated in construction than a watch. The study of the structure of animals was carried on extensively and made comparative by Georges Cuvier (1769-1832) and his followers. They dissected and observed, and reduced the architecture of animals to a science. Thus arose comparative morphology which is now considered the first stage of zoölogical study. It will be readily seen that structure may be taken to refer only to the more obvious parts, visible to the unaided eye, or may be also extended to include the minute construction of animal tissues. Cuvier's work in anatomy was mainly on the organs, but Bichat, his contemporary (1771-1801), pushed the analysis a step further and carefully examined the tissues. His influence on the progress of zoölogy was much greater than is generally appreciated. For it is a fact that has been gradually forced upon naturalists that the processes of life take place deep in the finer structure of animals and plants. Bichat did not reach the units of structure in his work, and studies in microscopic structure were carried to a deeper level before they reached this goal. This work was done for animal tissues in 1840 by Schwann (1810-81), and led to the establishment of the cell-theory (*q. v.*). In its original form the cell-theory was very imperfect; it was extended by the discovery that the cell is a globule of protoplasm containing a nucleus, and was molded into the protoplasm theory mainly through the work of Max Schultze in 1860. See Biology.

There is still another aspect of structural study that was brought out by observations on the development of animals. The structure of animals is so complicated that it is difficult to comprehend. There are, especially in higher animals, many rudimentary organs and traces of structures that do not conform to the life of the animal and to its position in the animal scale. Now, all animals begin their life in a microscopic rudiment — the egg, which in reality is a cell set free from the body of the parent. This cell by division gives rise to new cells which remain connected, and form the many cells out of which the tissues are built. Thus animals start in a state of simplicity and grow to complexity. By observing the various stages through which they pass we get clues to the meaning of the rudimentary organs and to the relationships of animals, that would be completely lacking if we could not observe them in the process of becoming. Hence, embryology or the development (*q. v.*) of life becomes the key to understanding animal structures. This important branch of zoölogy was started in its modern phase by Wolff in 1759; but Von Baer (1792-1876) is designated the Father of Modern Embryology, because about 1827 he made this study a tracing of the history of the cell-layers.

The study of structure leads naturally to the question of use: What is the particular office or function of the organs, the tissues and the cells? This line of study is called physiology. It is to be understood that, while advances were being made in reference to the construction of animals, similar advances were in progress in reference to their physiology. William Harvey (1578-1657), Haller (1708-77) and Johannes Müller (1801-58) represent a succession of investigators in this line who pushed physiology forward. Müller, in particular, by his extraordinary industry and great insight both into anatomy and into physiology had great influence on the progress of zoölogy.

Zoölogy up to 1860 is the product of the concurrent growth of knowledge in regard to the structure of animals (morphology), their development (embryology) and their vital activities (physiology). Then an additional element was introduced which has illuminated the whole field. This was the doctrine of organic evolution, as set forth by Darwin in 1859. We must note in passing that this was not the beginning of the doctrine of organic evolution (*q. v.*); it was the particular form of Darwin's explanation that led to its taking firm hold for the first time upon the minds of naturalists. From that time to the present the study of zoölogy has been dominated

by the idea of evolution, and animals and plants have been studied broadly, — in the light of their ancestral history. Progress is dependent still upon advance in anatomy, physiology and embryology, but the point of view from which the facts are considered has been changed.

We have now traced the rise of zoölogy in its principal phases down to the beginning of its especially modern aspect. The study of animal life is so great a field that naturally it has a number of divisions; it remains, therefore, to mention in a summary way its chief departments. That part of the subject which embraces the study of animal structure is *Morphology*. This word is generally used in a broad sense to mean something more than *Anatomy*, which is one division of morphology. The study of microscopic anatomy is *Histology*. It is not a different kind of study, and is separated from anatomy merely as a matter of convenience. The investigation of stages in animal development is *Embryology*. These divisions make up *Structural Zoölogy*. The general description and classification of animals is *Systematic Zoölogy*. The modern name for classification is *Taxonomy*. The *Geographical Distribution* of animals has been widely studied and elevated to the rank of a special department. Another set of studies concerning the lineage of all animals (*Evolution*) has led to broad considerations of the relation of living animals to their surroundings, to the universe and to man, and has given rise to *Philosophical Zoölogy*. Standing co-ordinate with the great field of morphology is *Physiology*, which, broadly speaking, concerns itself with the vital processes of all living organisms. *General Physiology* clearly is a department of zoölogy. Many experiments are being made to determine the responses and adaptations of animals to stimulations and to changes in the medium in which they live. This has opened the field of *Experimental Morphology*. Studies of the mental powers and the mental phenomena in animals lead to *Animal Psychology*, which may fairly be considered a part of zoölogy. A division called *Ætiology* is often recognized, having as its object the investigation of the causes of zoölogical phenomena, but it need not be assigned an independent rank, as the study of all phenomena has the discovery of their causes as an ultimate object.

The animal world is too extensive to attempt to give an outline view of it here, and reference must be made to textbooks for further consideration. Fuller accounts of some of the subjects touched upon in this article will be found under ANATOMY, DEVELOPMENT OF ANIMAL LIFE, EVOLUTION, CELL-DOCTRINE, PHYSIOLOGY, PROTOPLASM and SPONTANEOUS GENERATION. See, also, articles on such zoölogists as ARISTOTLE, CUVIER, DARWIN, MIVART, ROMANES, WALLACE, WEISSMANN and others.

Among the best books for the general reader and student of zoölogy are the following: Agassiz's *Methods of Study in Natural History;* Huxley's *The Crayfish. An Introduction to the Study of Zoölogy;* Hertwig's *General Principles of Zoölogy;* Lankester's *Zoölogy* in *The Encyclopædia Britannica;* Sedgwick and Wilson's *General Biology;* Parker's *Elementary Biology;* Thompson's *The Science of Life, The Study of Animal Life* and *Outlines of Zoölogy;* Verworn's *General Physiology;* Jordan and Kellogg's *Animal Life ;* Bell's *Comparative Anatomy and Physiology;* Parker and Haswell's *Textbook of Zoölogy* and *Manual of Zoölogy;* Boas' *Textbook of Zoölogy;* Brook's *Handbook of Invertebrate Zoölogy;* McMurrich's *Invertebrate Morphology;* Shipley and McBride's *Textbook of Zoölogy;* Weidersheim's *Comparative Anatomy of Vertebrates;* Lang's *Comparative Anatomy;* Romanes' *Darwin and after Darwin;* Osborn's *From the Greeks to Darwin;* Balfour's *Comparative Embryology;* Marshall's *Vertebrate Embryology;* Hertwig's *Textbook of Embryology;* Korschelt and Heider's *Invertebrate Embryology;* Wallace's *Geographical Distribution of Animals* and *Malay Archipelago;* Bates' *Naturalist on the Amazons;* Heilprin's *Geographical and Geological Distribution of Animals;* and *The Standard Natural History*, edited by Kingsley. For books on birds, butterflies, insects etc. see those topics. Among the best smaller zoölogies for secondary schools are those of Colton, Davenport, Kellogg, Needham and Packard. WILLIAM A. LOCY.

Zoöphyte (*zō′ō-fīt*), an old name for marine animals forming branching or tree-like colonies and, therefore, presenting a general resemblance to plants. The sponges, hydroids, branching corals and polyzoans were included under this very general title. The name signifies the plant-animal, and is more especially applicable to hydroids and branching corals. See HYDROZOA.

Zoöspore (*zō′ō-spōr*) (in plants), the swimming asexual spores of algæ, notably the green algæ. The name means animal-spores, referring to the fact that they move like aquatic animals. See SPORE.

Zoroas′ter is the name of the founder of what is known as the Parsi religion of ancient Persia. He seems to have been born in Bactria, but most of the legends concerning his history are utterly unreliable. Even the time when he lived is uncertain, but it may be safely asserted to have been as early as 1000 B. C.; possibly he was a contemporary of Moses. The fundamental idea of Zoroaster's creed is its dualism. At the beginning there existed two spirits: *Ormuzd*, who represented the good, and *Ahriman*, the evil. Ormuzd is light and

life, law, order, truth and all that is pure and holy; while Ahriman is darkness, falsehood, corruption, evil and death. These two spirits are represented as in perpetual conflict for the mastery of the world; but the final triumph of Ormuzd, the good spirit, is promised to comfort the hearts of all the faithful. Other features of Zoroaster's system of doctrine may be briefly mentioned: (1) the principal duty of man in this life is to obey the word and commandments of God; (2) disobedience is punished with the death of the sinner; (3) those who obey the word of God will be free from all defects; (4) men should pray to God and worship, as He always hears the prayers of the good; (5) the souls of the pure and good will enjoy everlasting life, while those of the wicked will suffer everlasting punishment.

Zouaves (*zo͞o-äv'*), a body of troops in the French army, which derives its name from a tribe of Moors in Algeria, who were taken into the French service after the conquest of that country in 1830. They were first united in the same battalions with French soldiers, retaining their Moorish dress; but, as it was soon found that the system of commingling the two races was not practicable, the French and the Kabyles were formed into separate companies. Gradually, however, the Kabyles were eliminated, and since 1840 Zouaves have been correctly described as French troops in a Moorish dress. They are recruited from the veterans of the ordinary infantry regiments, who are distinguished for fine physique, tried courage and hardihood. The uniform consists of a loose jacket and waistcoast of blue cloth ornamented with yellow braid; loose, madder-colored trousers; brown cloak; madder-colored fez cap with a yellow tassel, surrounded by a green turban; a light-blue sash of wool; yellow leather leggings; and white gaiters. They are armed with a carbine and a sword-bayonet.

Zu'lu (*zo͞o'lo͞o*) is the name of that portion of the Kafir race who inhabit Natal and the region northeast of it, until they gradually merge into the mere negro of the eastern coast north of the Zambezi. The Zulu is a more amiable savage than his brother of the Cape's frontier-districts. He is less warlike, more industrious and far more willing to act as farm-laborer or domestic servant. He by nature is social, light of heart and cheerful. His affections are steady and enduring, but his passions are strong and are called out in all their force in war. Whatever better nature he may possess, when his chief commands war he is converted into a demon. That the warlike qualities of the Zulus have not decayed was seen in the war that broke out in 1879 between England and Cetewayo (*q. v.*), the Zulu king.

Zu'luland is a province of Natal, between it and Portuguese East Africa. Previous to the war of 1879 there was no good map of the Zulu country, and even yet we know little of its geology or mineral productions. Asbestos of the Canadian or short-fiber variety has been discovered. The interior is healthy, fertile and arable. Rich gold-reefs have been found, excellent coal is mined, and there is a railway to Tugela River. The principal rivers are Umvolozi or St. Lucia River, which enters the sea about 80 miles northeast of the former Natal frontier, and the Mapoota and its branches, which drain the north of the region and fall into Delagoa Bay. None of these rivers is available for inland navigation, although a large lagoon near the mouth of the St. Lucia can be ascended for a few miles. The rivers which flow into Delagoa Bay are sluggish streams, with scarcely perceptible currents, and can be ascended for some distance. The principal inhabitants are of the Zulu race, but the Portuguese have a settlement on Delagoa Bay where they carry on some trade with the natives and the Boers. In December of 1897 Zululand was incorporated with Natal under the British crown. Its area is 10,461 square miles, with an estimated population of 225,000 including 1,100 whites. It has a representative in the legislative council, and sends two members to the legislative assembly. See NATAL.

Zuñi, a tribe of Indians belonging to the Pueblo group See PUEBLOS.

Zürich (*zĕ'rĭk*), a city of Switzerland, capital of the canton of the same name, is at the point where the Limmat issues from the lake of Zürich and unites with its tributary, the Sihl. It is one of the most prosperous manufacturing and commercial towns of Switzerland. Yet the narrow streets and lofty houses of its older quarters give it the appearance of a medieval city. There are many interesting old buildings, the most remarkable being the cathedral erected in the 11th century. The town's library is an extensive one, and numerous museums of natural history and other similar institutions indicate the intelligence and cultivated tastes of the inhabitants. There is a polytechnic school with 935 students and 455 listeners, and the University of Zürich has 133 instructors and 1,412 students. Population 186,846.

Zürich, a lake of Switzerland, surrounded by the three cantons of Zürich, St. Gall and Schwyz. It is between 20 and 25 miles in length, about two in breadth, and about 500 feet deep. It is noted for beautiful scenery, the hills around being covered with numerous gardens, vineyards and orchards.

Zuyder Zee (*zī'dĕr zē*), a bay on the coast of Holland, separated from the North Sea or German Ocean by the four islands

of Texel, Vlieland, Terschelling and Ameland. It is from 75 to 80 miles in length, its greatest breadth being 35 or 40 miles. In the time of the Romans the Zuyder Zee was a marshy lake communicating with the North Sea by a small river, but in the latter part of the 13th century two heavy inundations took place which broke down the dikes and submerged the whole territory, except the four islands named, making it an arm of the North Sea.

Zwingli (*tsvĭng'lē*), **Ulrich,** Swiss reformer, was born at Wildhaus in the canton of St. Gall on Jan. 1, 1484. After being educated at Bern and at Basel, he became pastor in Glarus in 1506. Having begun to study Greek in 1513, he devoted himself from that time to the study of the New Testament, even going so far as to learn by heart the Epistles of Paul in the original language. In 1518 he was called to Zürich, and in 1522 the Reformation was formally established in that city. In 1524 Zwingli married, and soon after *Of the True and False Religion* was published. Luther and Zwingli agreed on most points, but there was a serious breach between them in regard to the real presence of Christ in the Lord's Supper, Luther adhering to this dogma and Zwingli denying it. A conference, arranged by Philip, landgrave of Hesse, was held between them at Marburg in 1529, but after spending three days in earnest discussion they separated without coming to any agreement on the point at issue. In 1531 open war broke out between Zürich and the Roman Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden and Zug; and Zwingli, by command of the Council of Zürich, had to take the field with the banner of a canton, which had always been borne by a priest. The Zürichers met their foes at Kappel, but were outnumbered and defeated, Zwingli being among the slain. A great bowlder, roughly squared, marks the place where he fell on Oct. 11, 1531.

Zygomorphous (*zĭg'ō-môr'fŭs*) **Flowers,** those in which the parts of a single set are not all alike. The term is chiefly applied to irregularity of petals. For example, in the sweet pea the petals are very much unlike. In most of the mints the five petals are so modified that two form an upper lip and three a lower lip, making the so-called bilabiate flower. The contrasting term is actinomorphic (*q. v.*) flowers. See FLOWER.

Zygospore (*zĭg'ō-spōr*) (in plants), a spore formed by the union of two similar gametes, as in some of the lower *Thallophytes* (*Spirogyra*, for example). It merely is a sexual spore or oöspore, but the name is convenient in indicating the nature of the gametes. The word "zygote" is sometimes used instead of zygospore.

Zyg'ote. See ZYGOSPORE.

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